US011324391B2

(12) **United States Patent**
**Yamaya**

(10) **Patent No.: US 11,324,391 B2**
(45) **Date of Patent: May 10, 2022**

(54) **DISTAL-END COVER FOR ENDOSCOPE, AND ENDOSCOPE**

(71) Applicant: **OLYMPUS CORPORATION**, Tokyo (JP)

(72) Inventor: **Koji Yamaya**, Hachioji (JP)

(73) Assignee: **OLYMPUS CORPORATION**, Tokyo (JP)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 287 days.

(21) Appl. No.: **16/585,093**

(22) Filed: **Sep. 27, 2019**

(65) **Prior Publication Data**

US 2020/0037860 A1 Feb. 6, 2020

**Related U.S. Application Data**

(63) Continuation of application No. PCT/JP2018/007021, filed on Feb. 26, 2018.

(30) **Foreign Application Priority Data**

Mar. 30, 2017 (JP) ..... JP2017-067480

(51) **Int. Cl.**
***A61B 1/00*** (2006.01)
***A61B 1/018*** (2006.01)

(52) **U.S. Cl.**
CPC ..... ***A61B 1/00135*** (2013.01); ***A61B 1/00098*** (2013.01); ***A61B 1/00101*** (2013.01); ***A61B 1/00128*** (2013.01); ***A61B 1/018*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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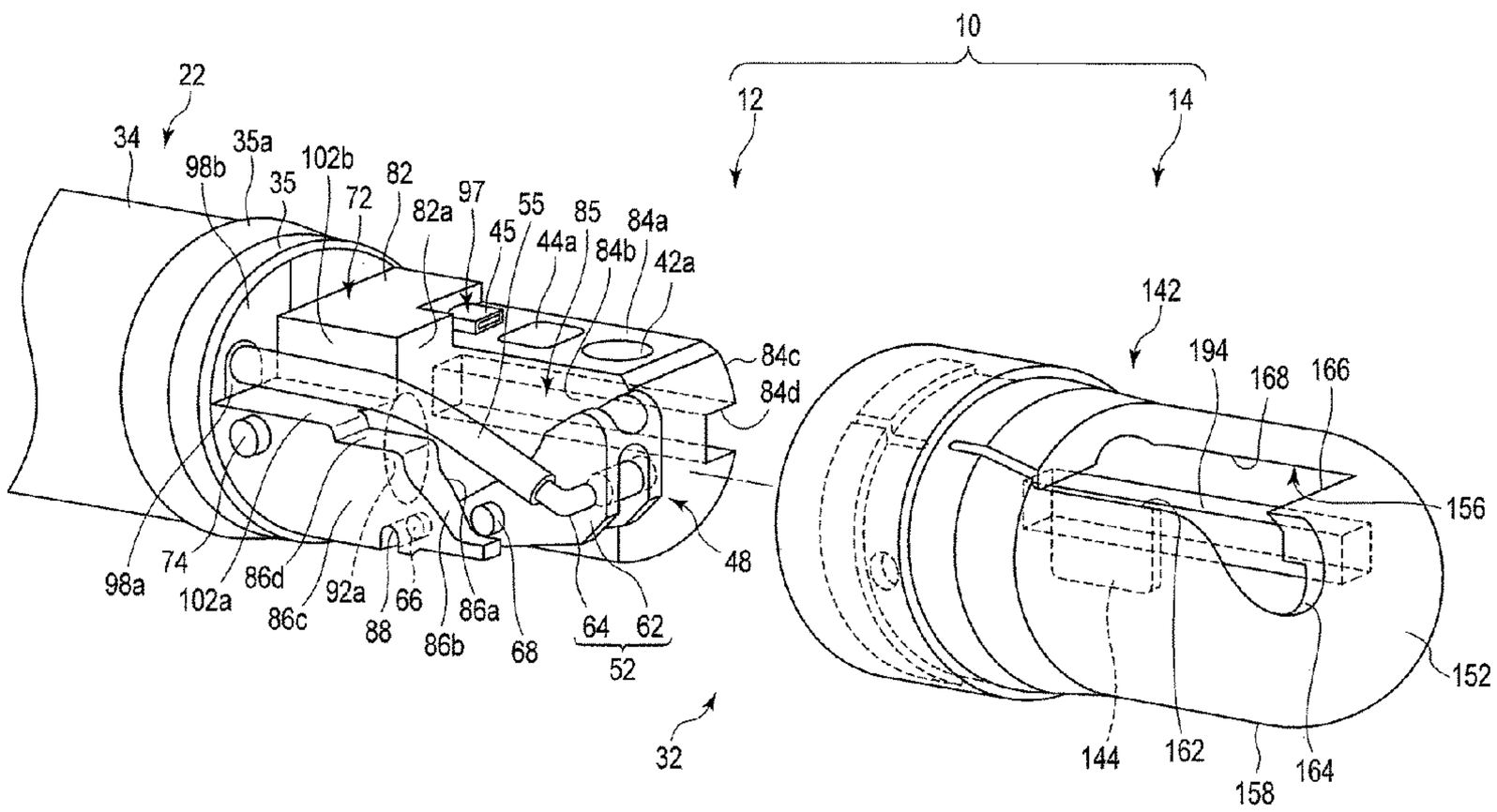
*Primary Examiner* — Timothy J Neal
(74) *Attorney, Agent, or Firm* — Scully, Scott, Murphy & Presser, P.C.

(57) **ABSTRACT**

A distal-end cover is attached to a distal frame portion of an insertion portion of an endoscope main body, along a longitudinal axis of the insertion portion. The distal-end cover includes a cover main body attached to the distal frame portion and a wall provided on the cover main body. The wall is provided between a tube and a raising portion closer to the distal-end side along the longitudinal axis than a first opening edge portion of the distal frame portion when the cover main body is attached to an outside of the distal frame portion along the longitudinal axis of the insertion portion. The wall is deformed by the tube and an elongated member when the cover main body is removed from the outside of the distal frame portion.

**20 Claims, 26 Drawing Sheets**



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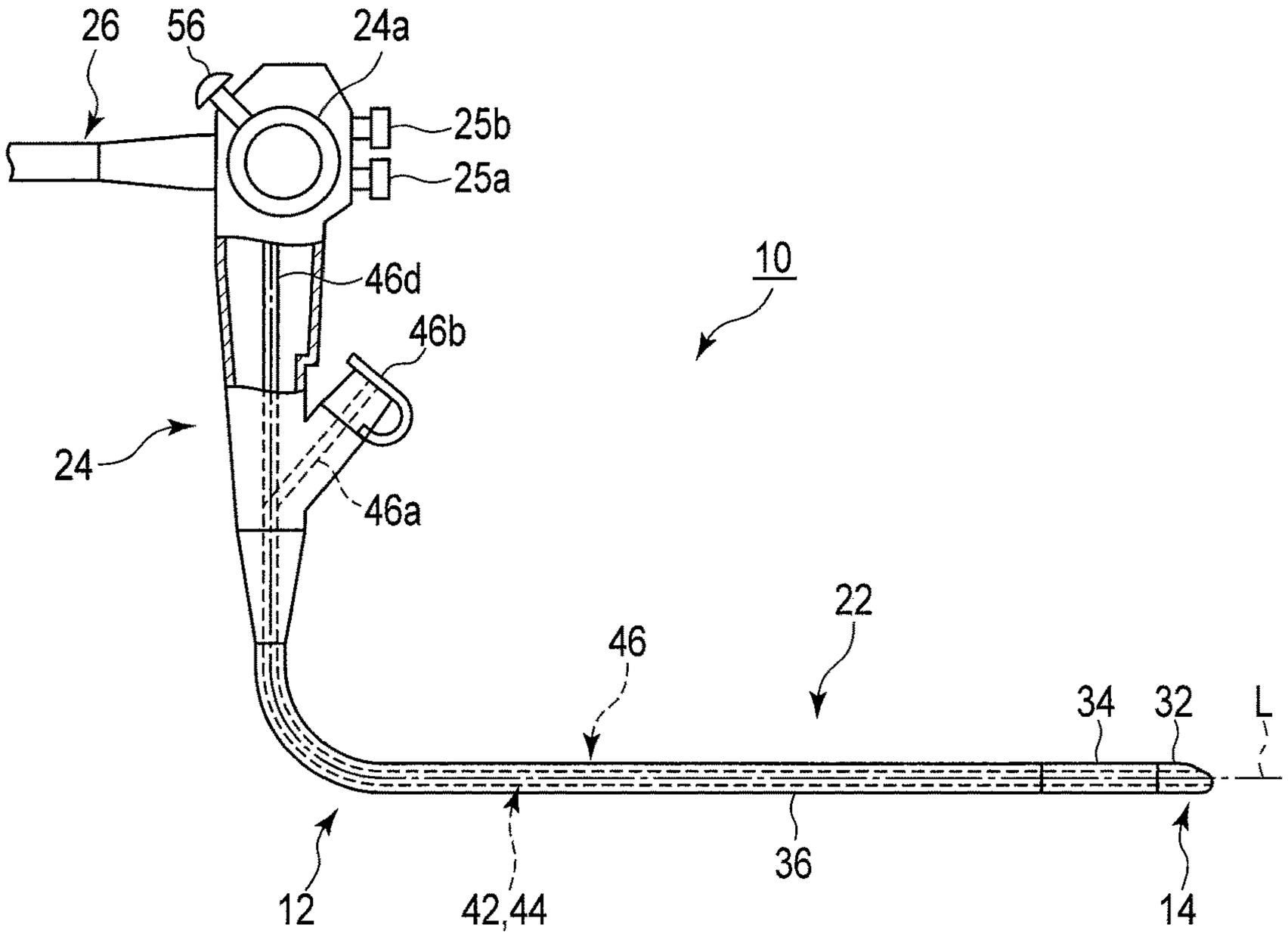
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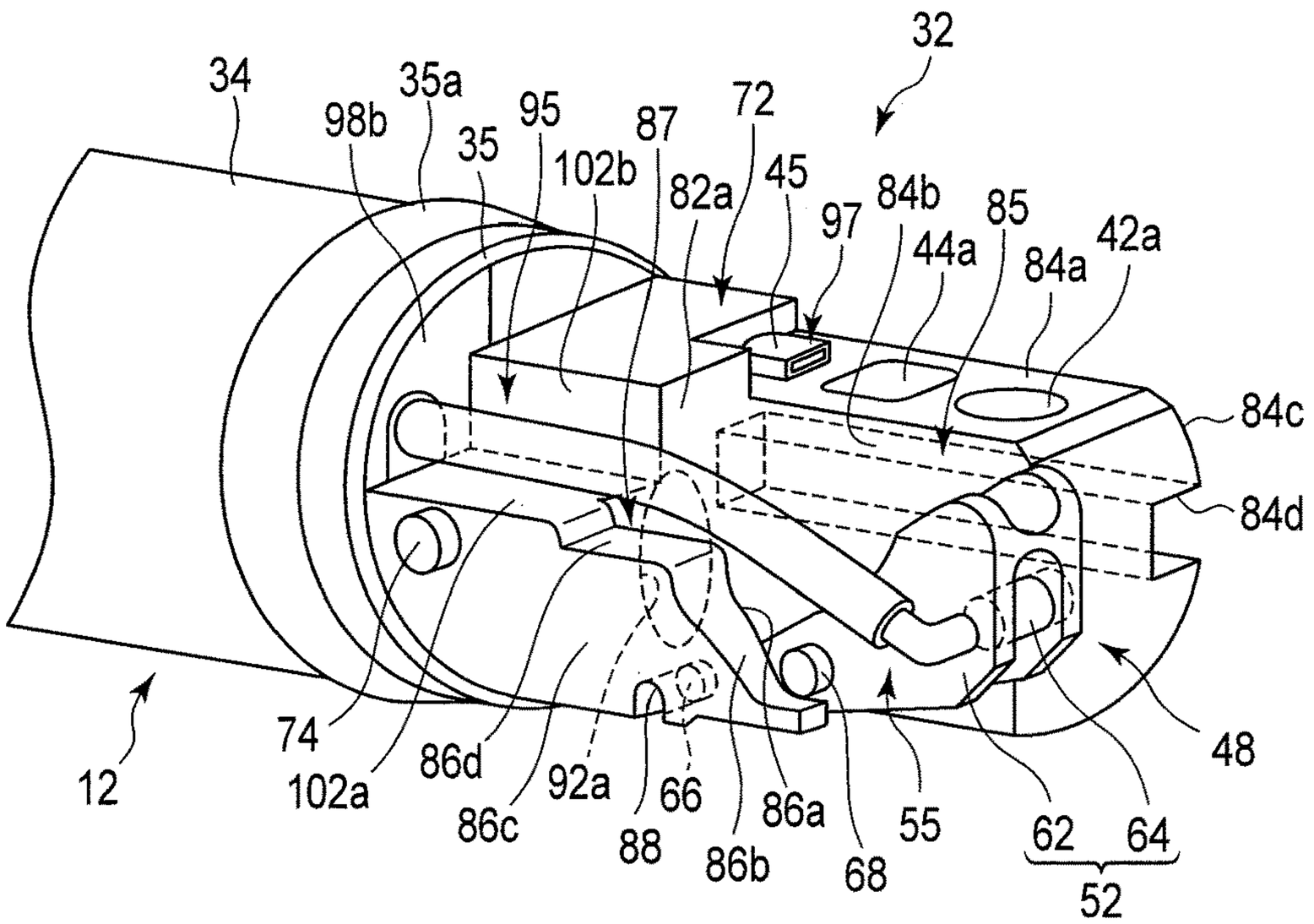
14

FIG. 1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84c
84d
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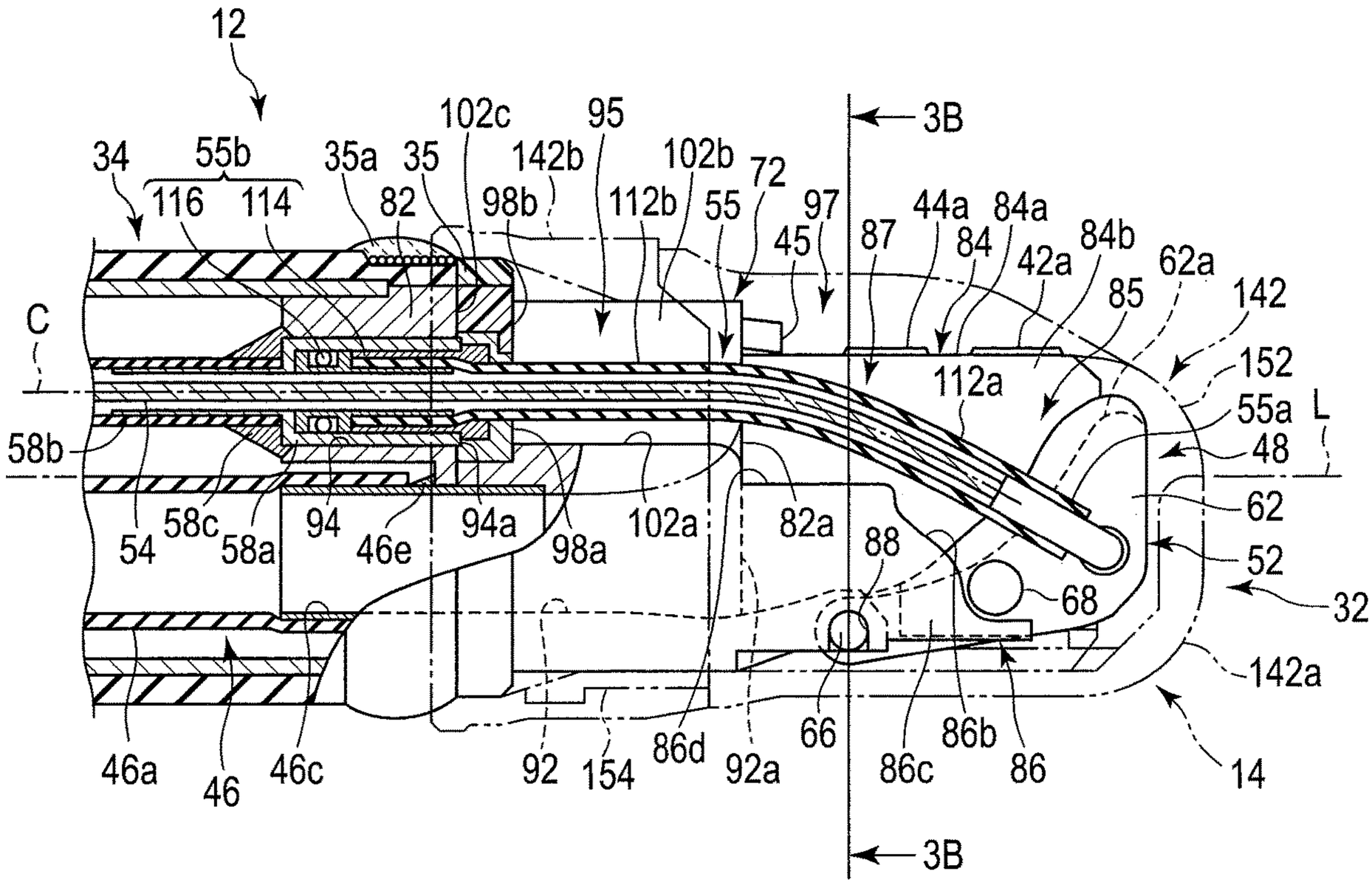
FIG. 2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45
87
44a
84
84a
42a
84b
62a
85
142
C
152
112a
55a
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58b
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62
54
58c
58a
94
46e
94a
98a
102a
82a
88
52
68
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142a
46a
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46c
92
154
86d
92a
66
86c
86b
86
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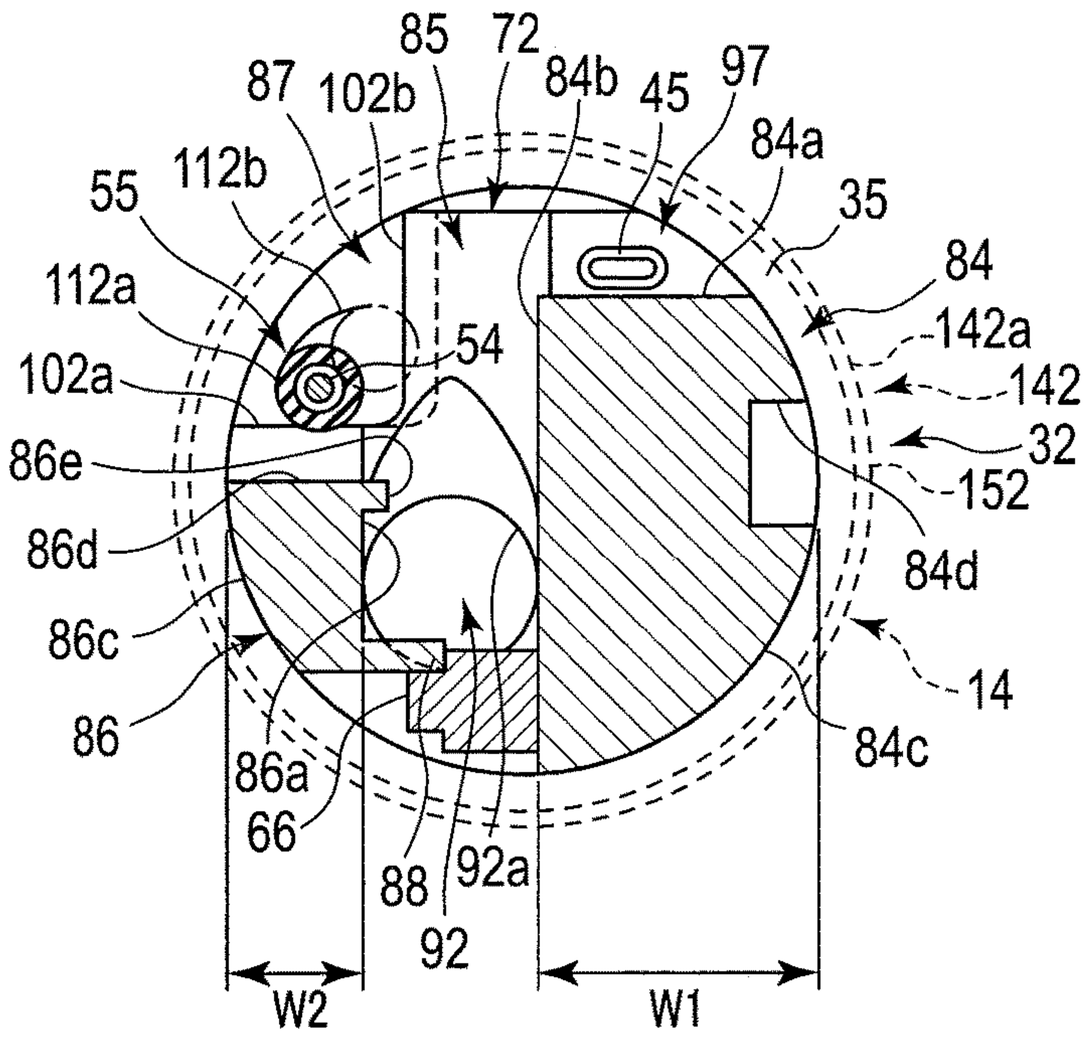
3B

FIG. 3A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102a
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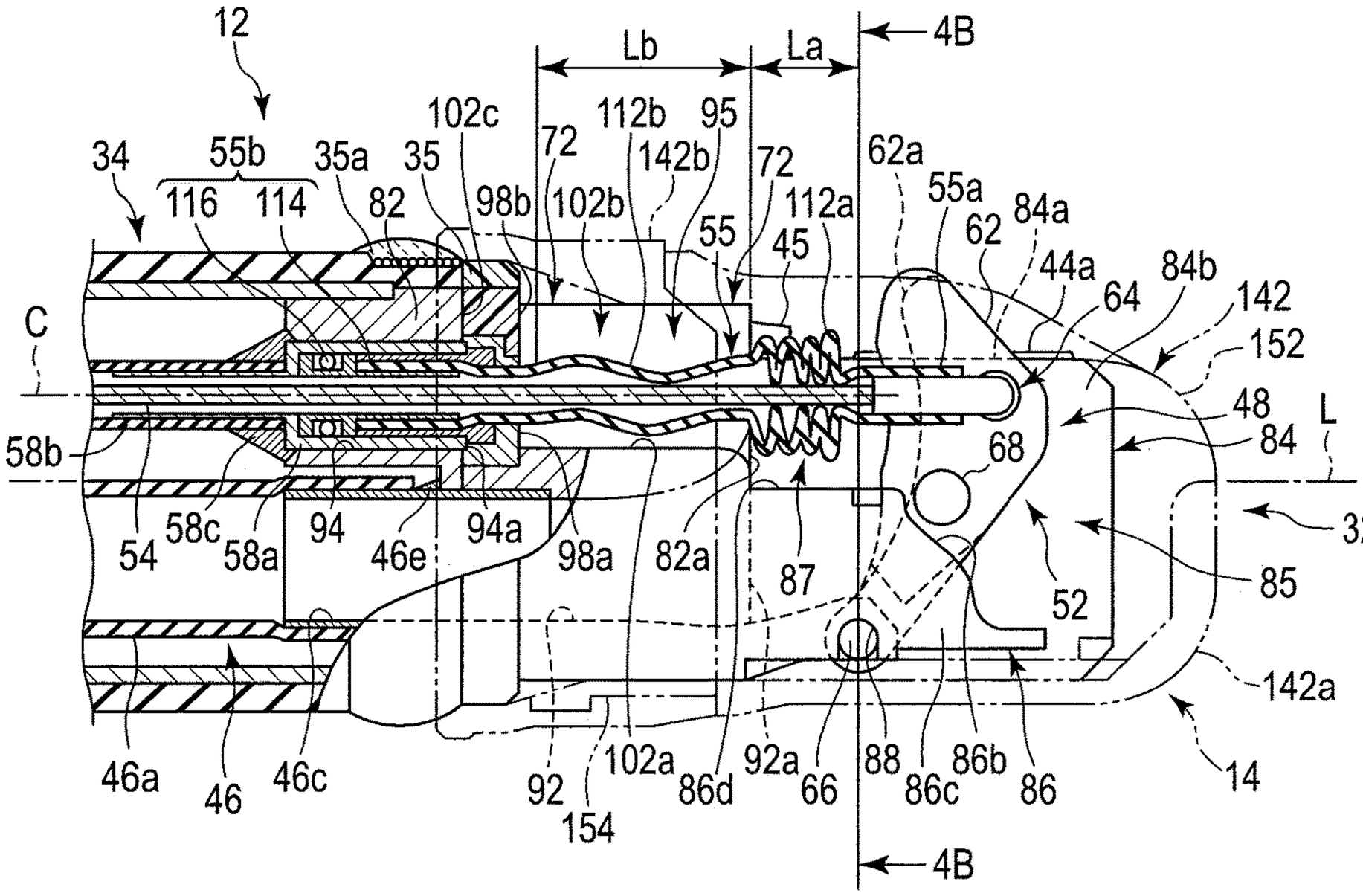
86d
84d
86c
14
86
84c
86a
66
88
92a
92
W2
W1

FIG. 3B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142b
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102b
55
112a
55a
62
84a
C
45
44a
64
84b
142
152
48
L
58b
68
84
54
58c
58a
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46e
94a
98a
82a
87
52
85
32
46a
46
46c
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102a
86d
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66
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86c
86b
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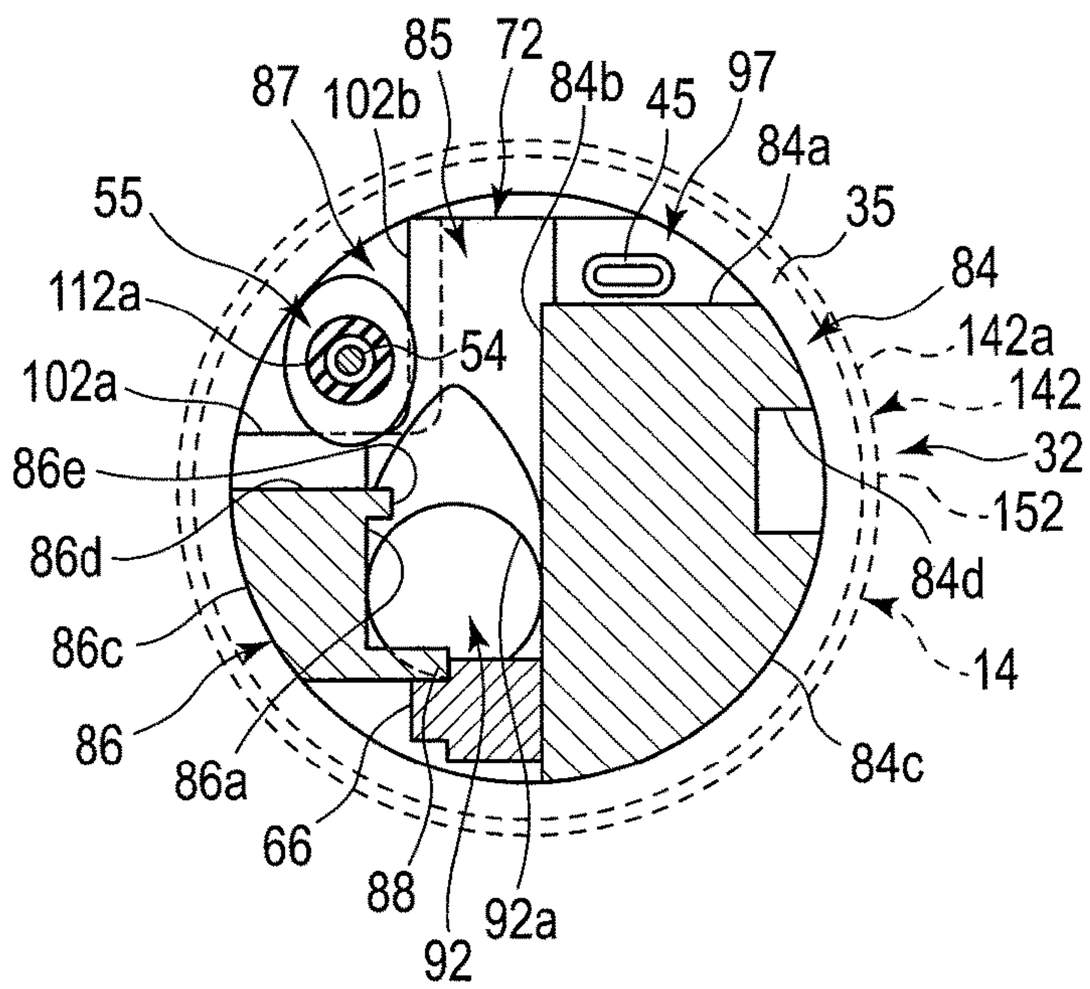
14
142a
154
4B

FIG. 4A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102a
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86c
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86
86a
84c
66
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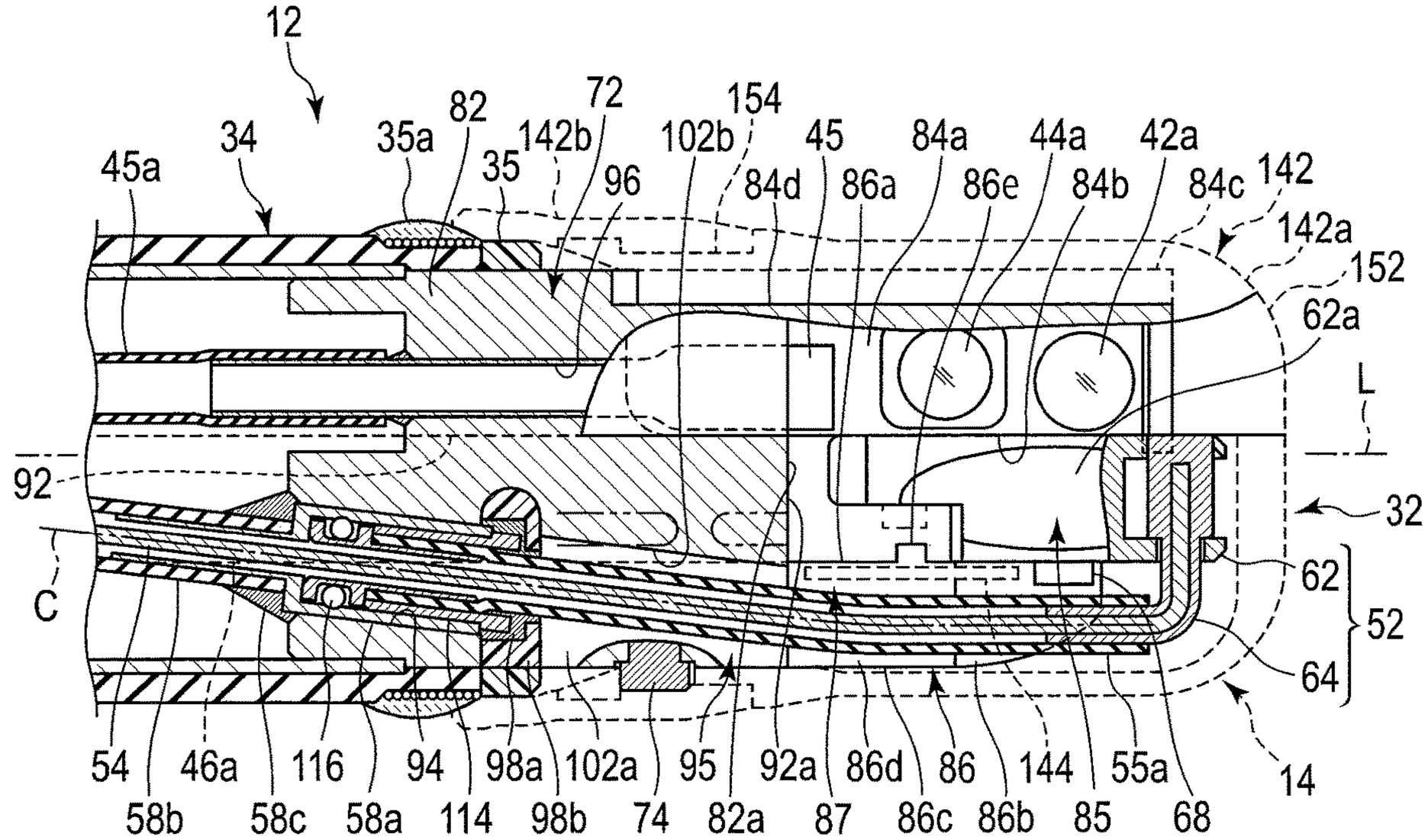
92a
92

FIG. 4B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102b
154
45
84d
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44a
84b
42a
84c
142
142a
152
62a
L
92
C
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58b
46a
58c
116
58a
94
114
98a
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82a
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86d
86c
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86b
144
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55a
68

FIG. 5

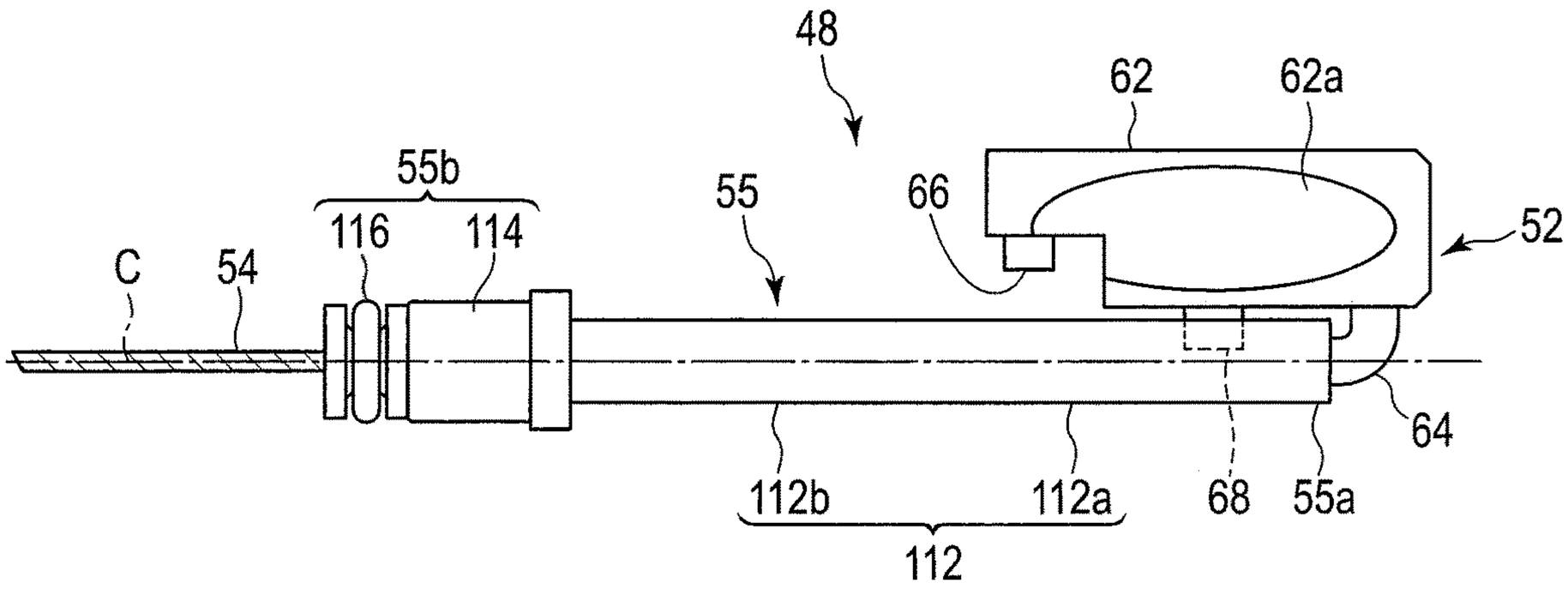



FIG. 6A

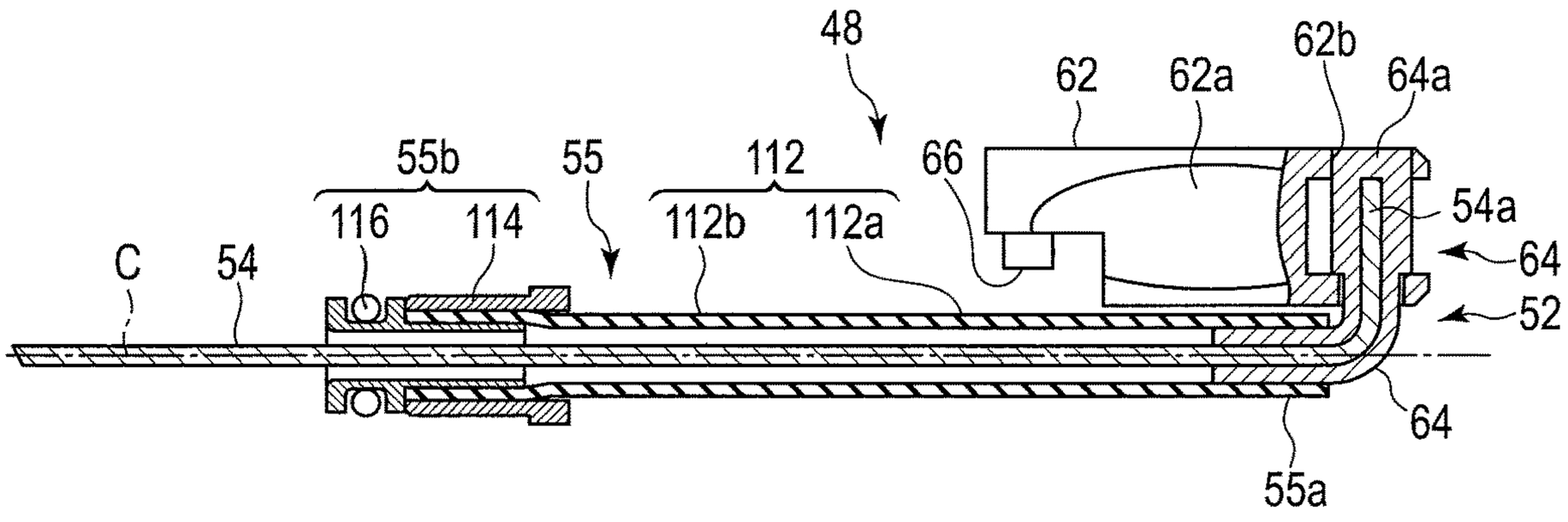



FIG. 6B

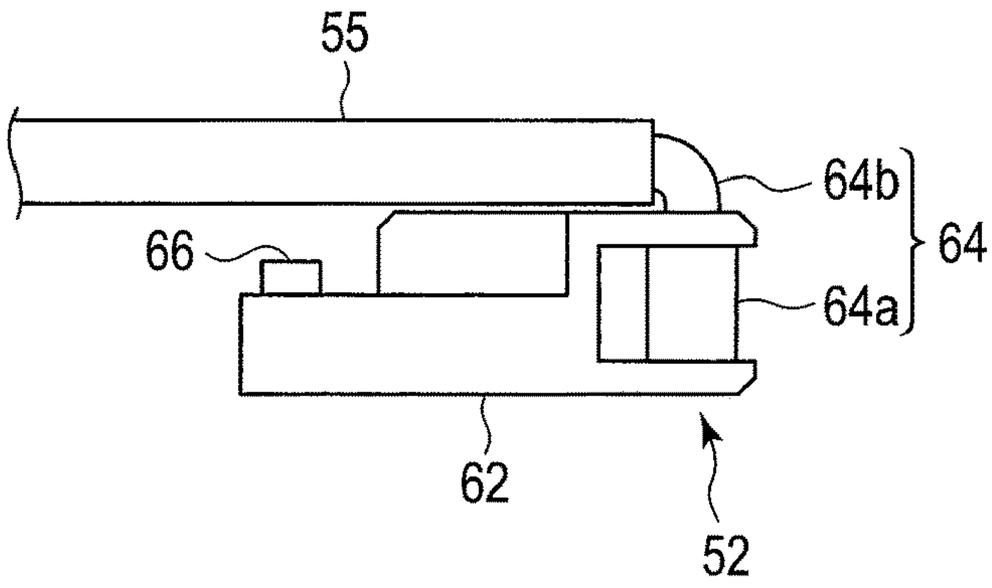
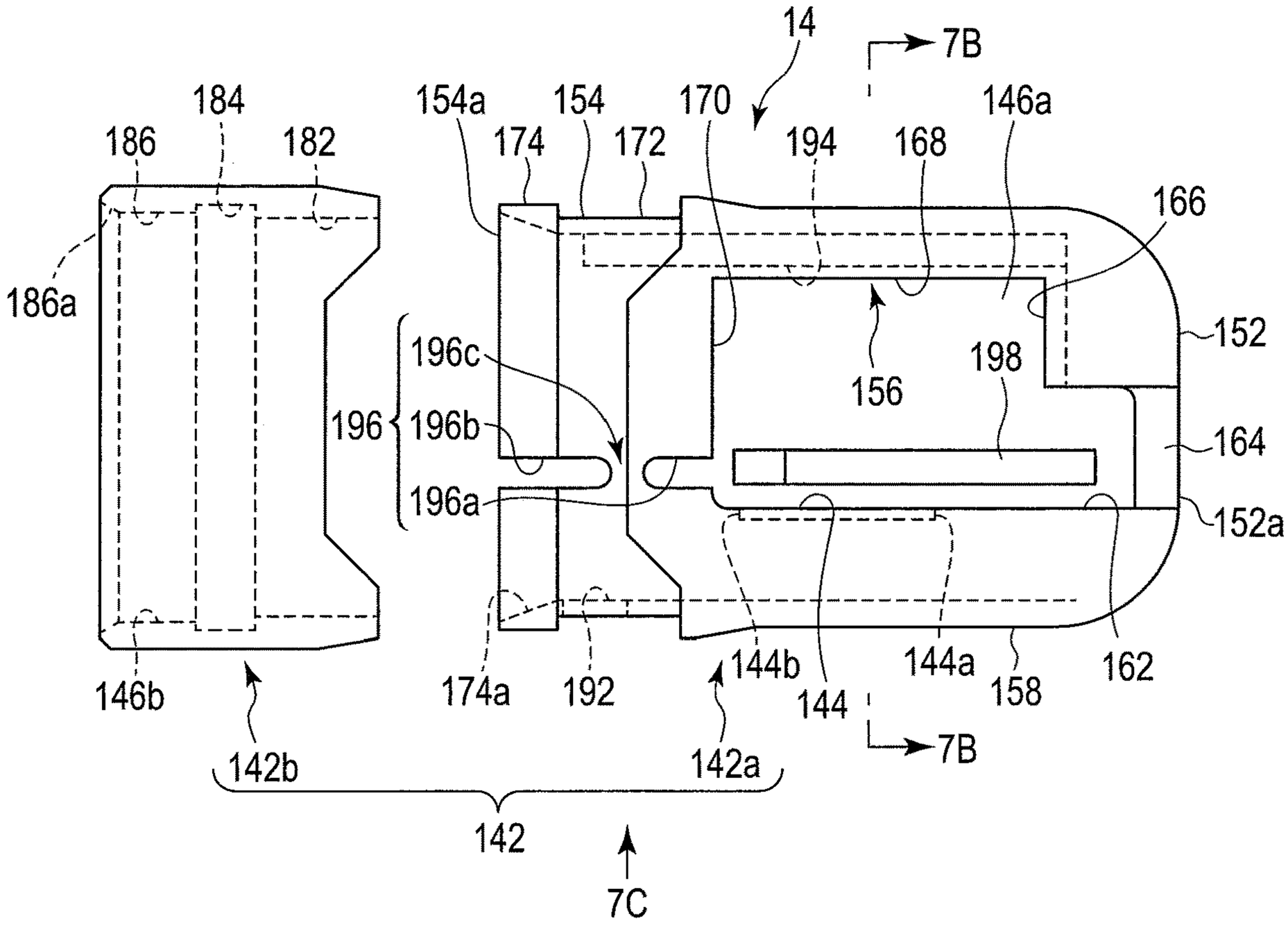



FIG. 6C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7B
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196
196b
164
196a
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7B
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142a
142
7C

FIG. 7A

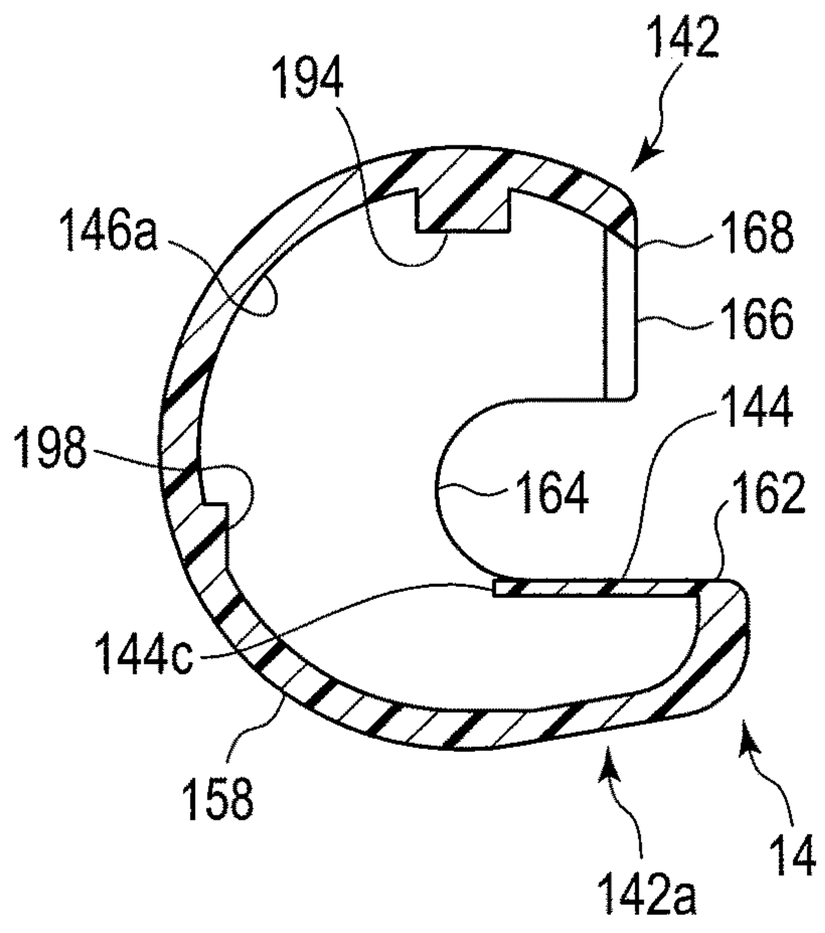
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FIG. 7B

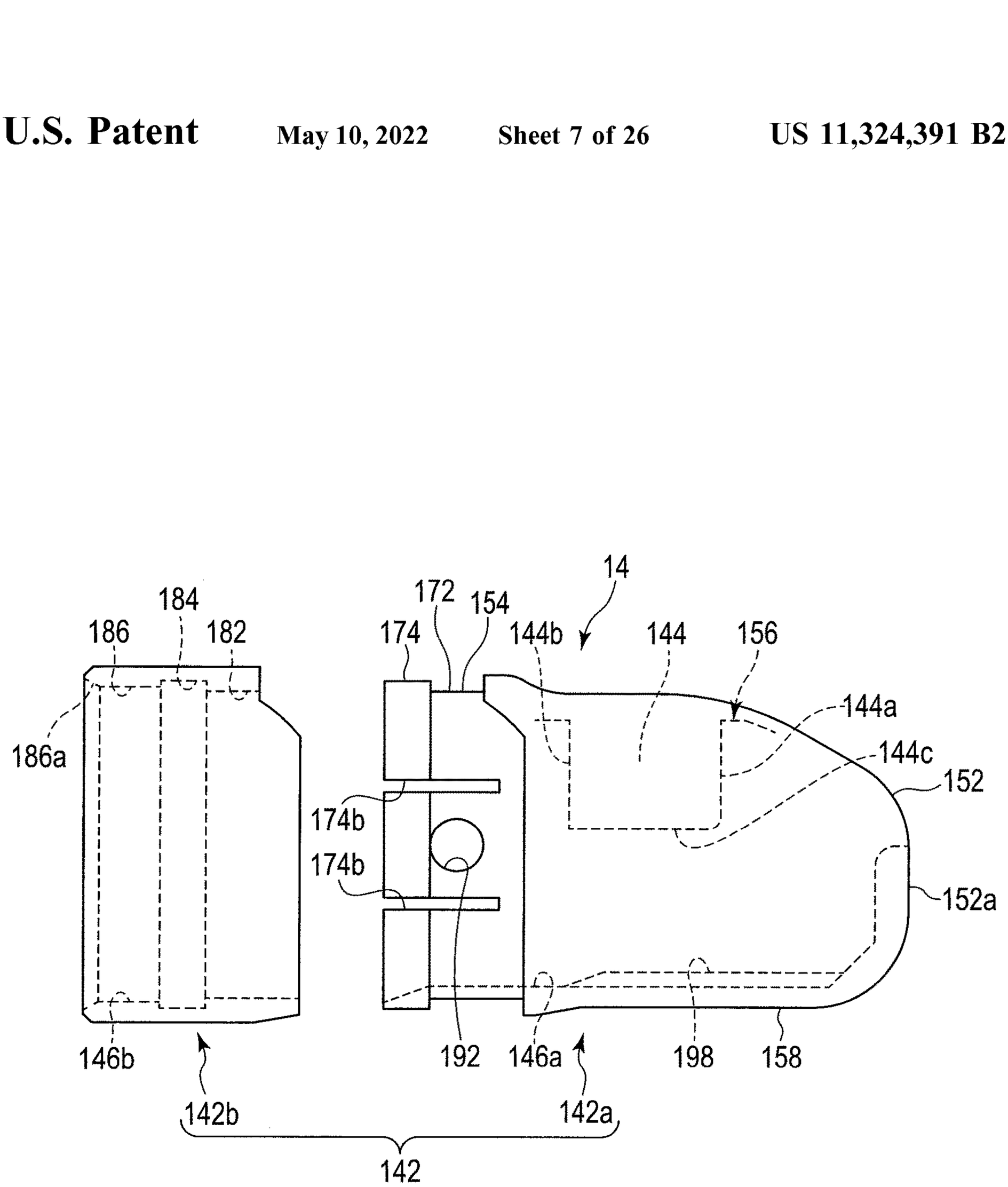
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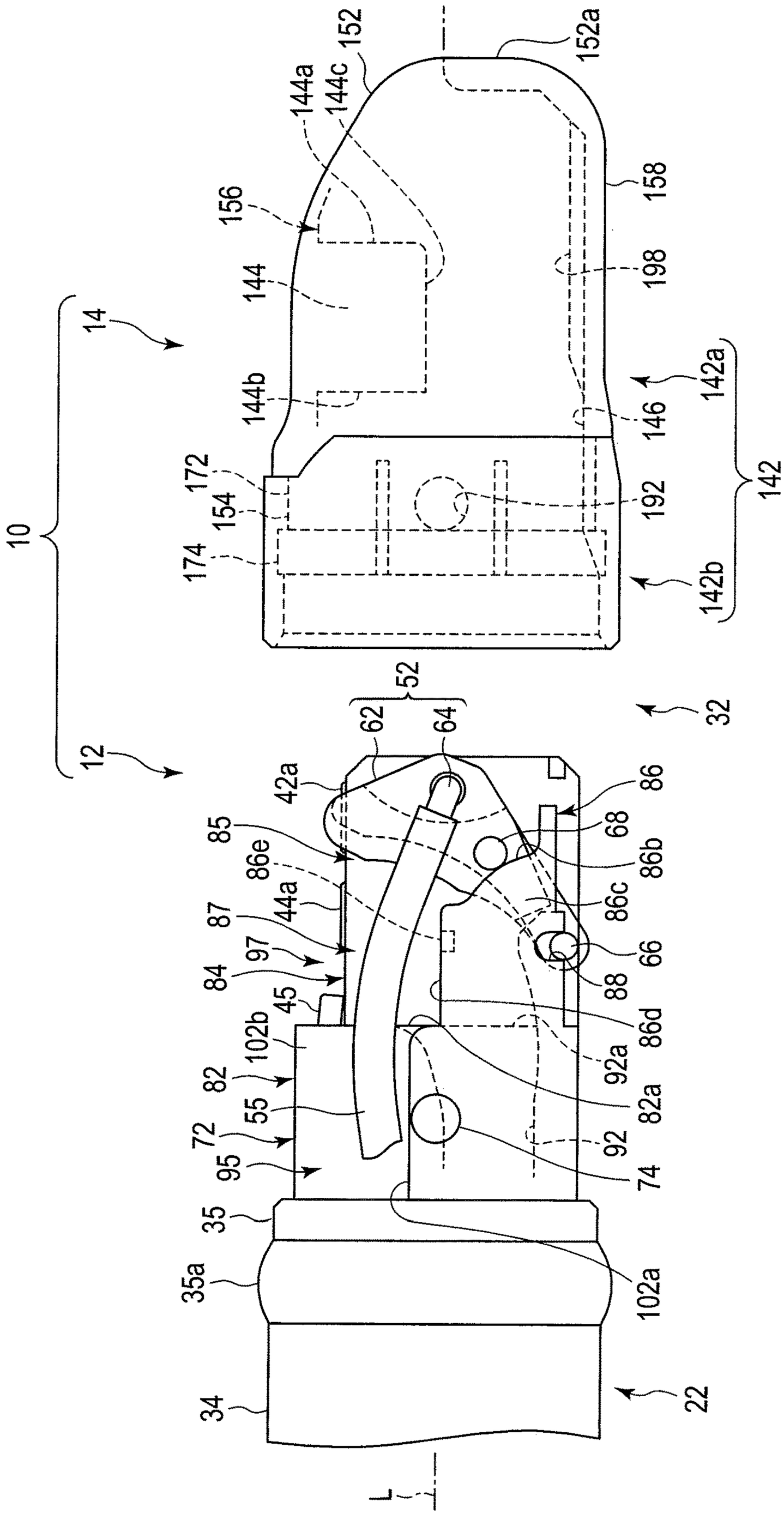
FIG. 7C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42a
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86e
86b
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44a
86c
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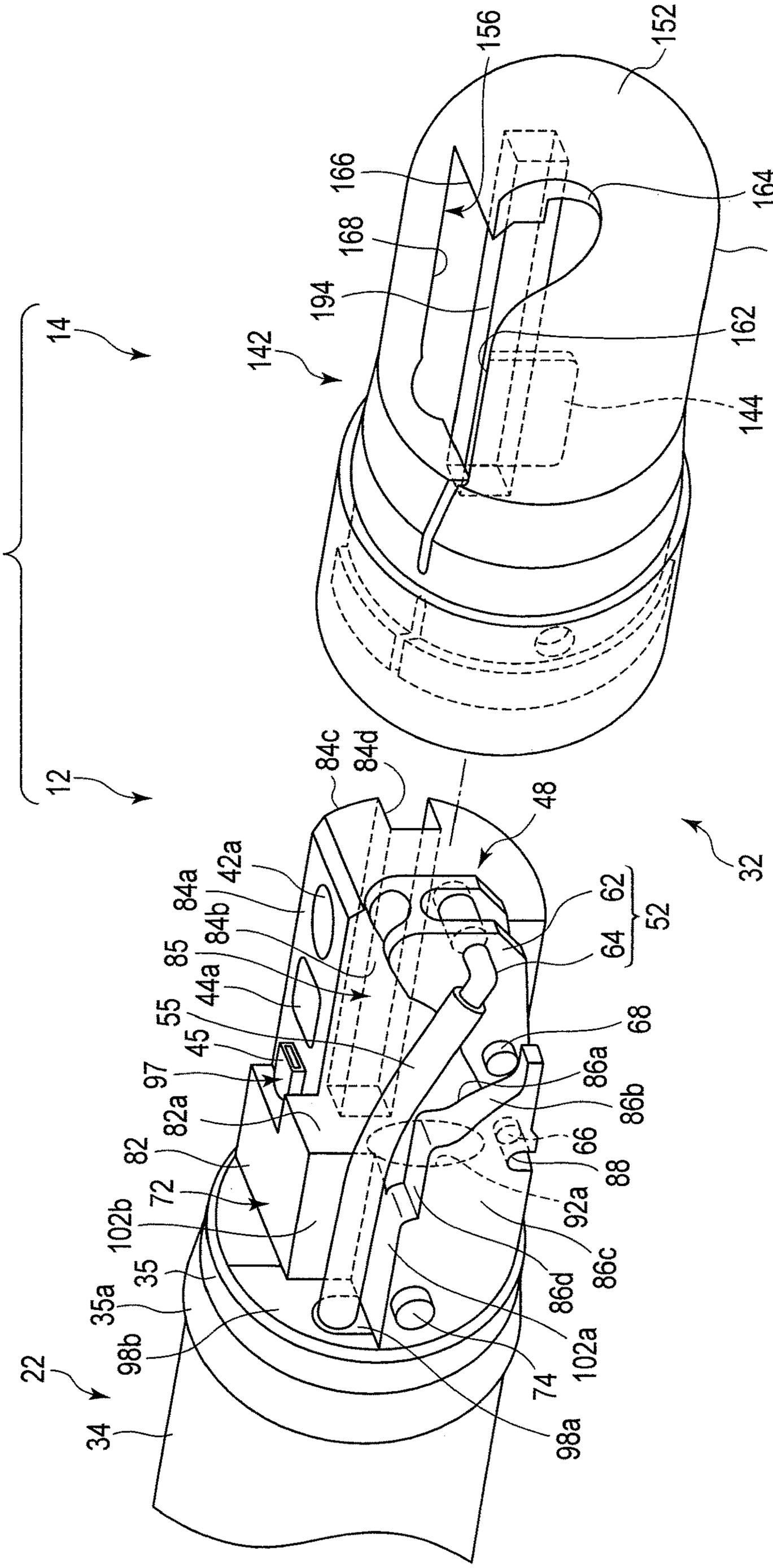
FIG. 8A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44a
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45
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82a
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102b
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35a
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FIG. 8B

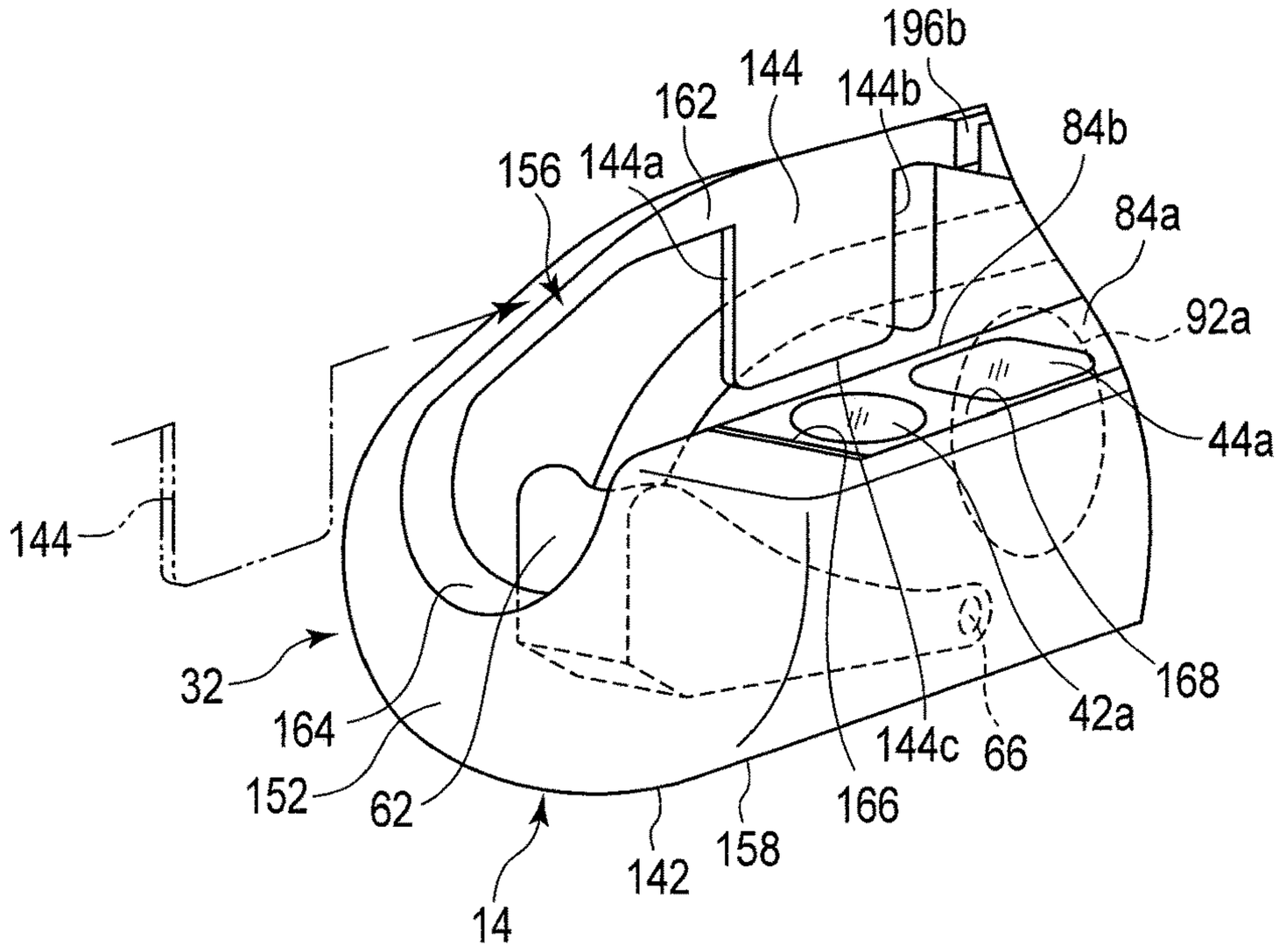
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FIG. 9A

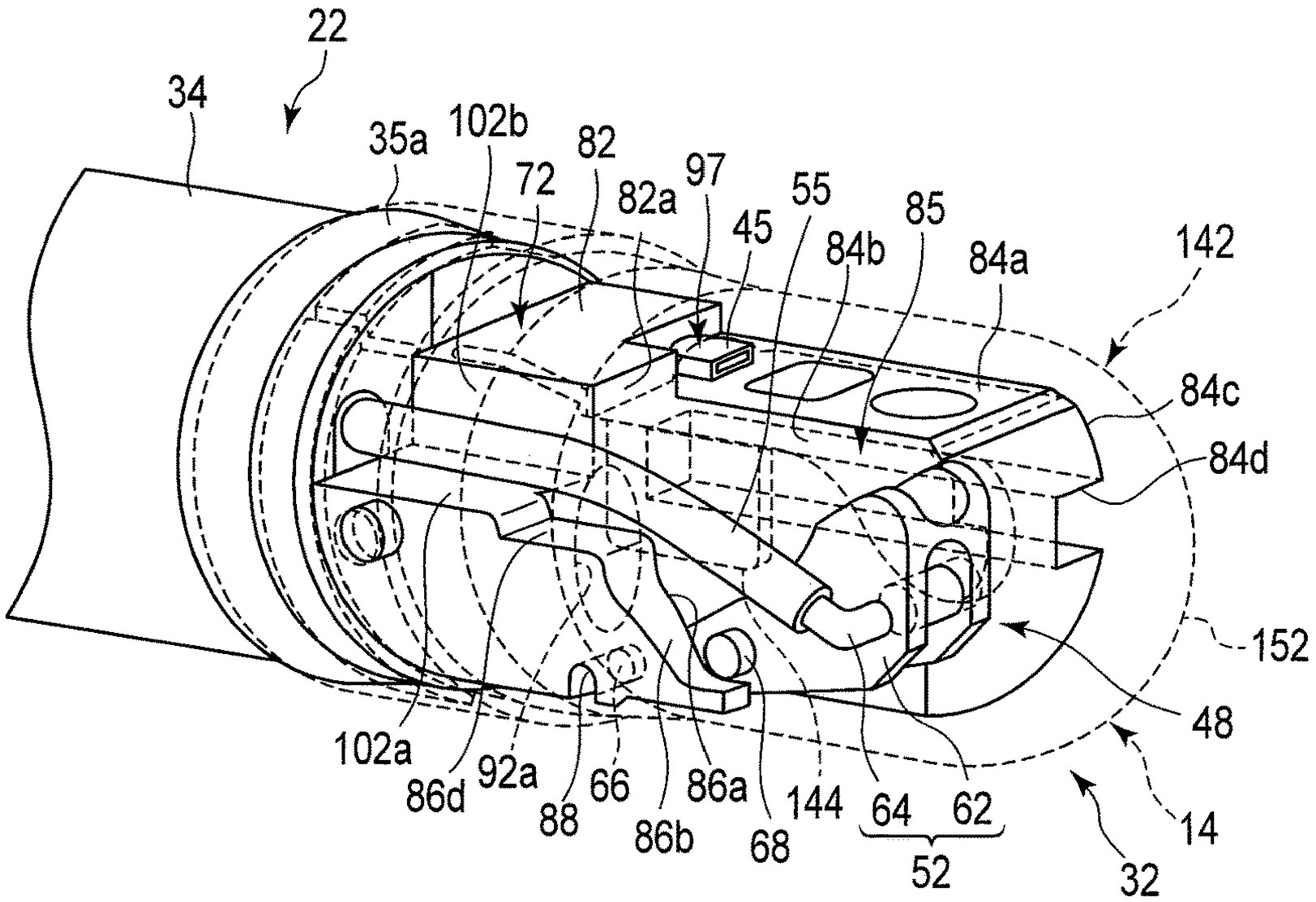
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FIG. 9B

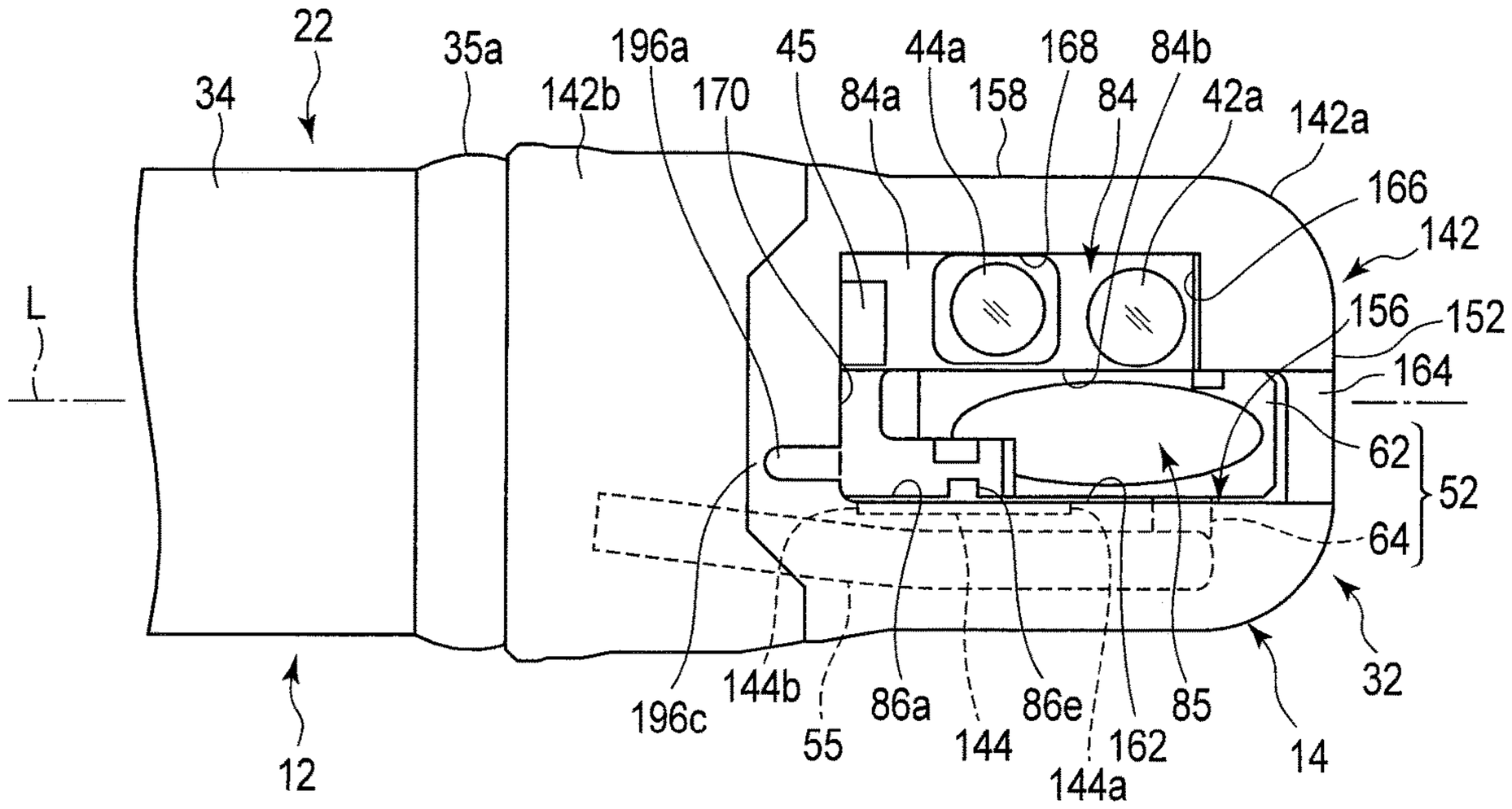



FIG. 9C

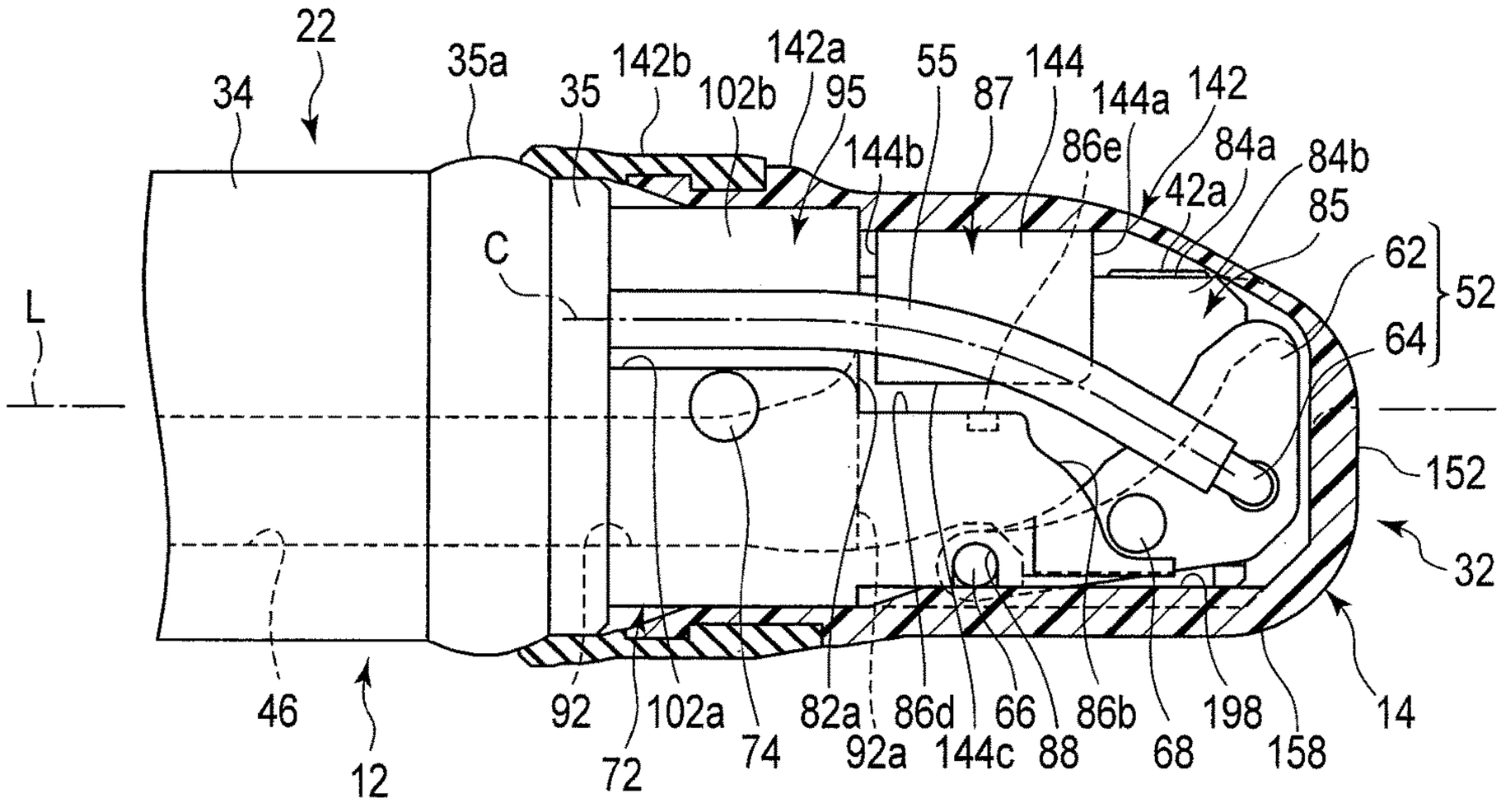
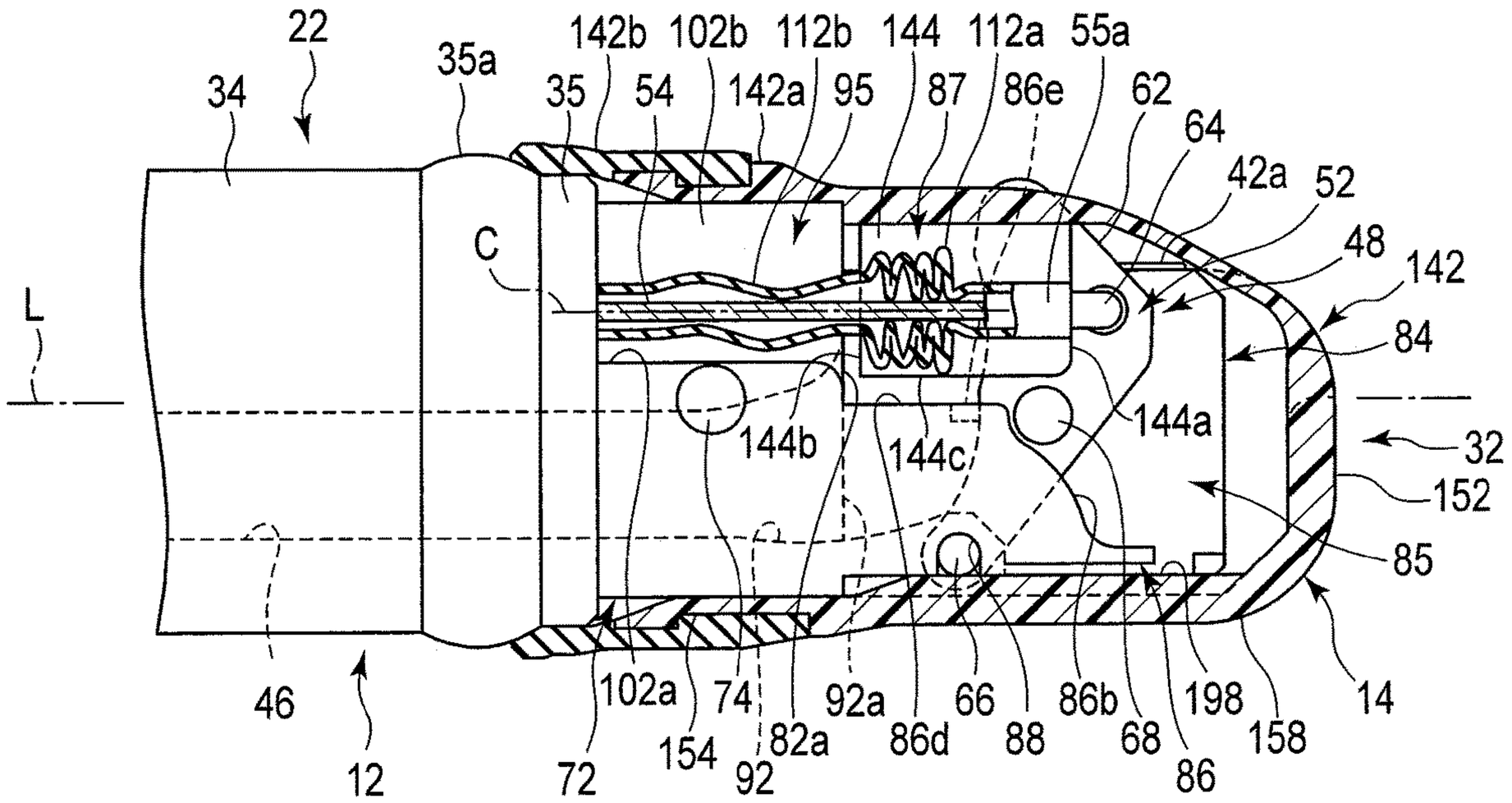
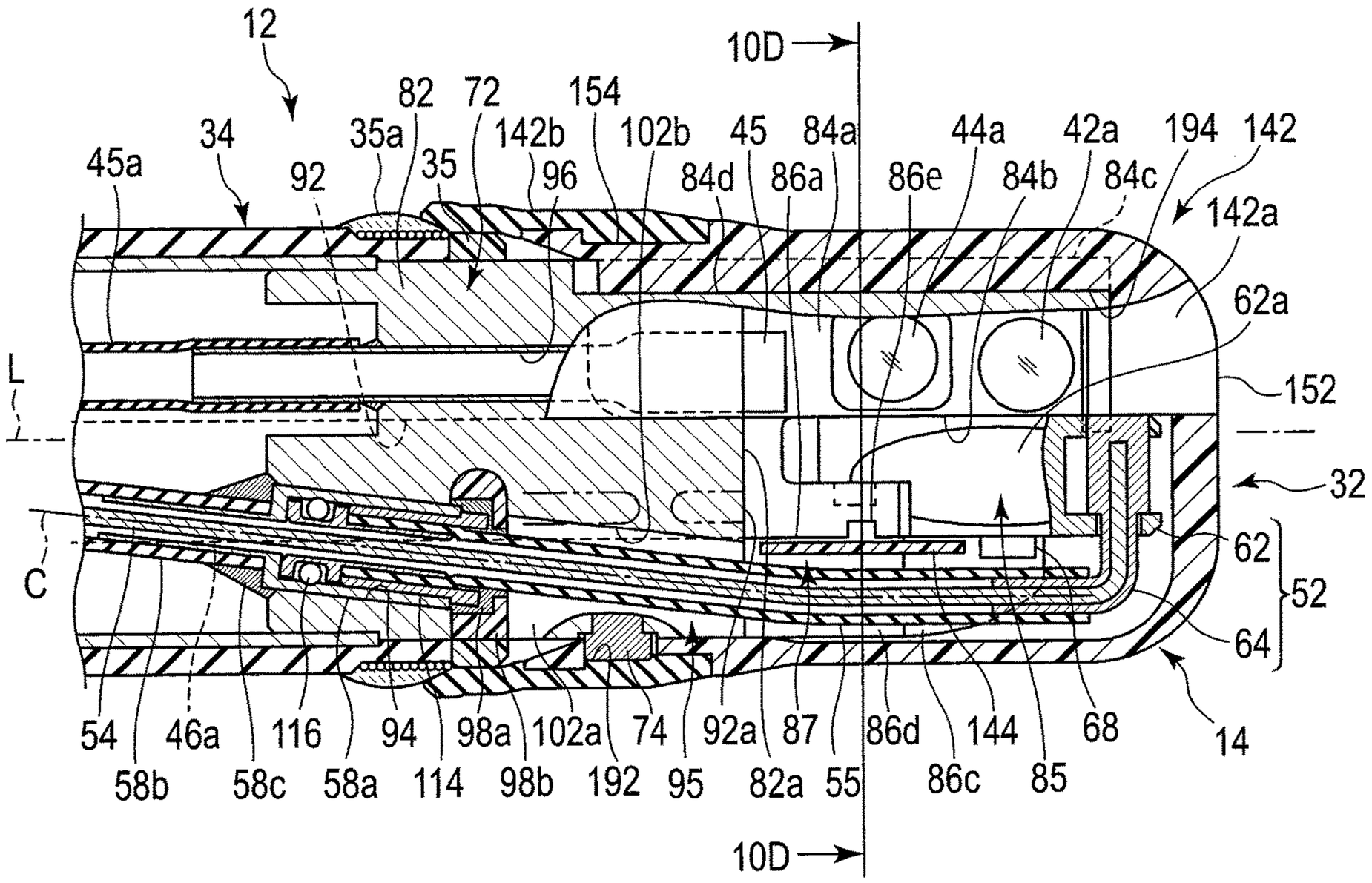



FIG. 10A




F I G. 10B




F I G. 10C

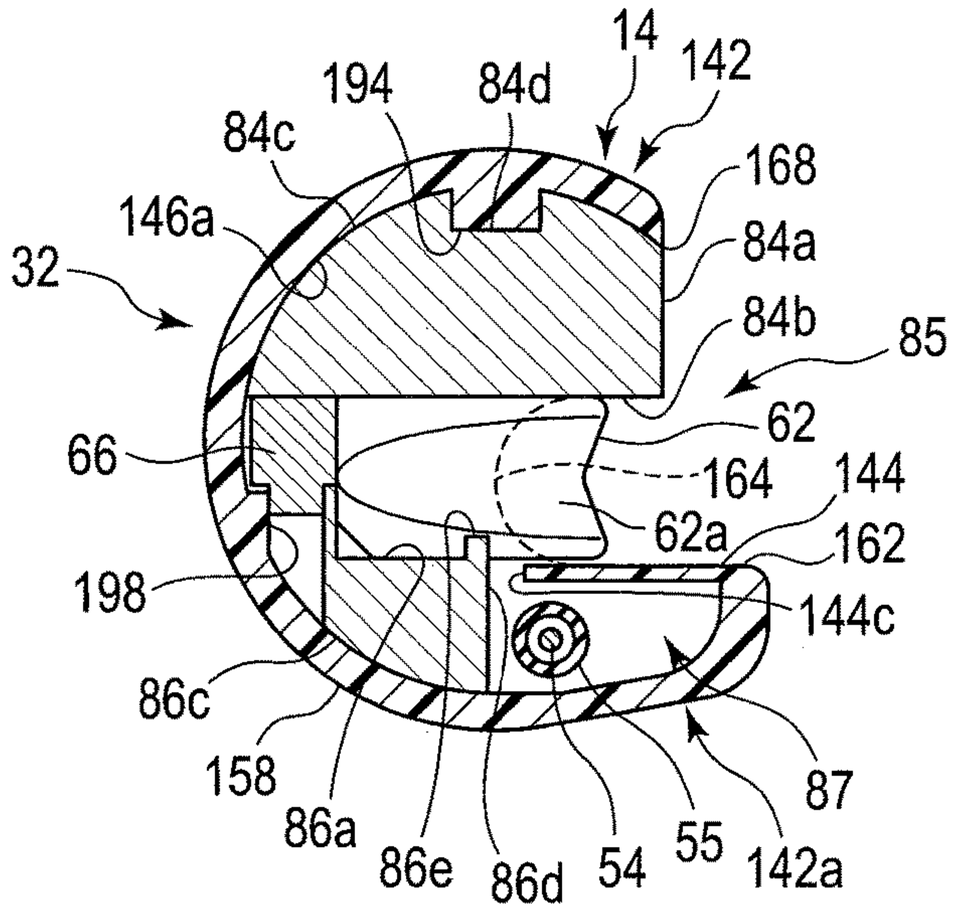



FIG. 10D

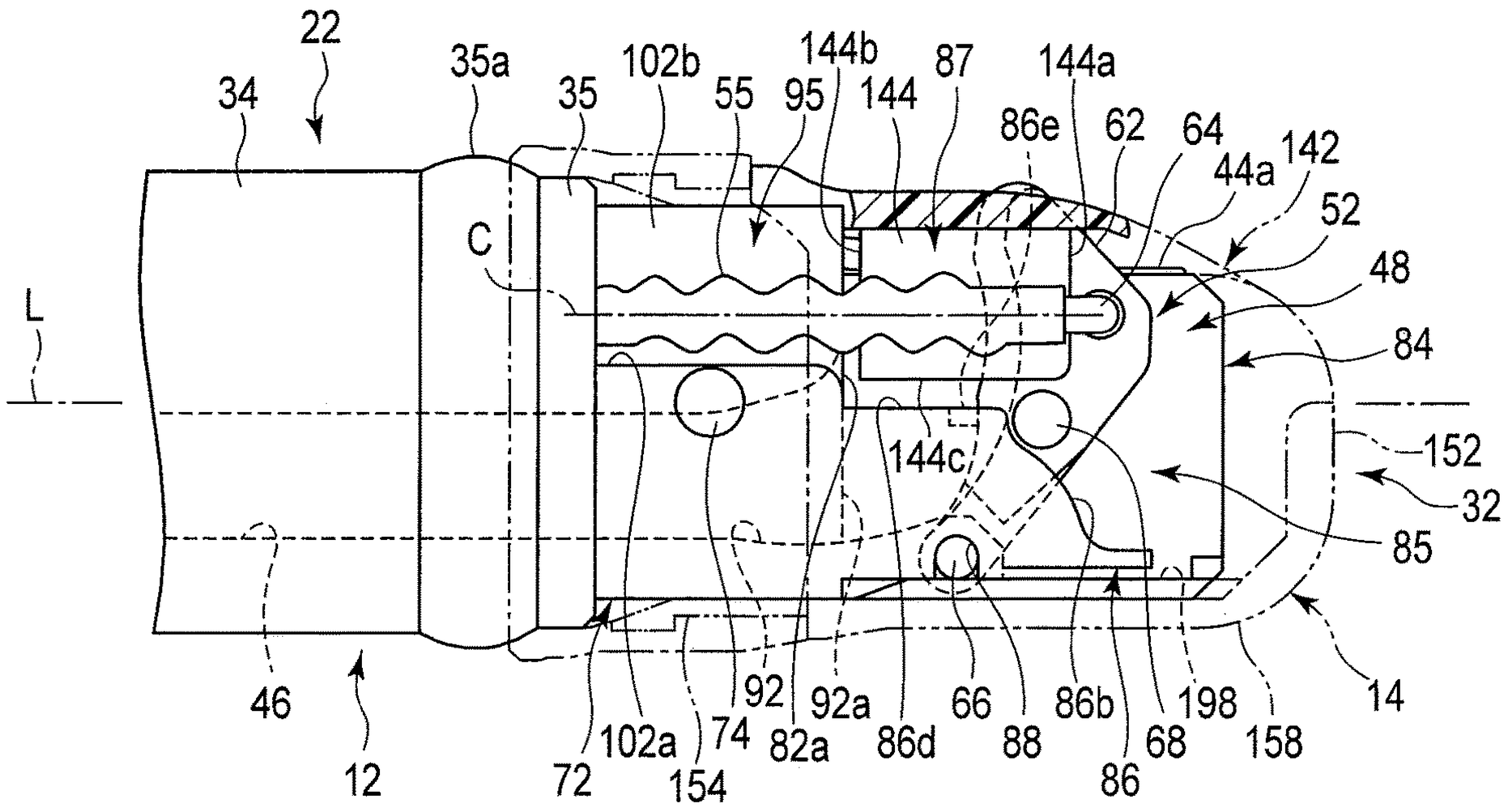
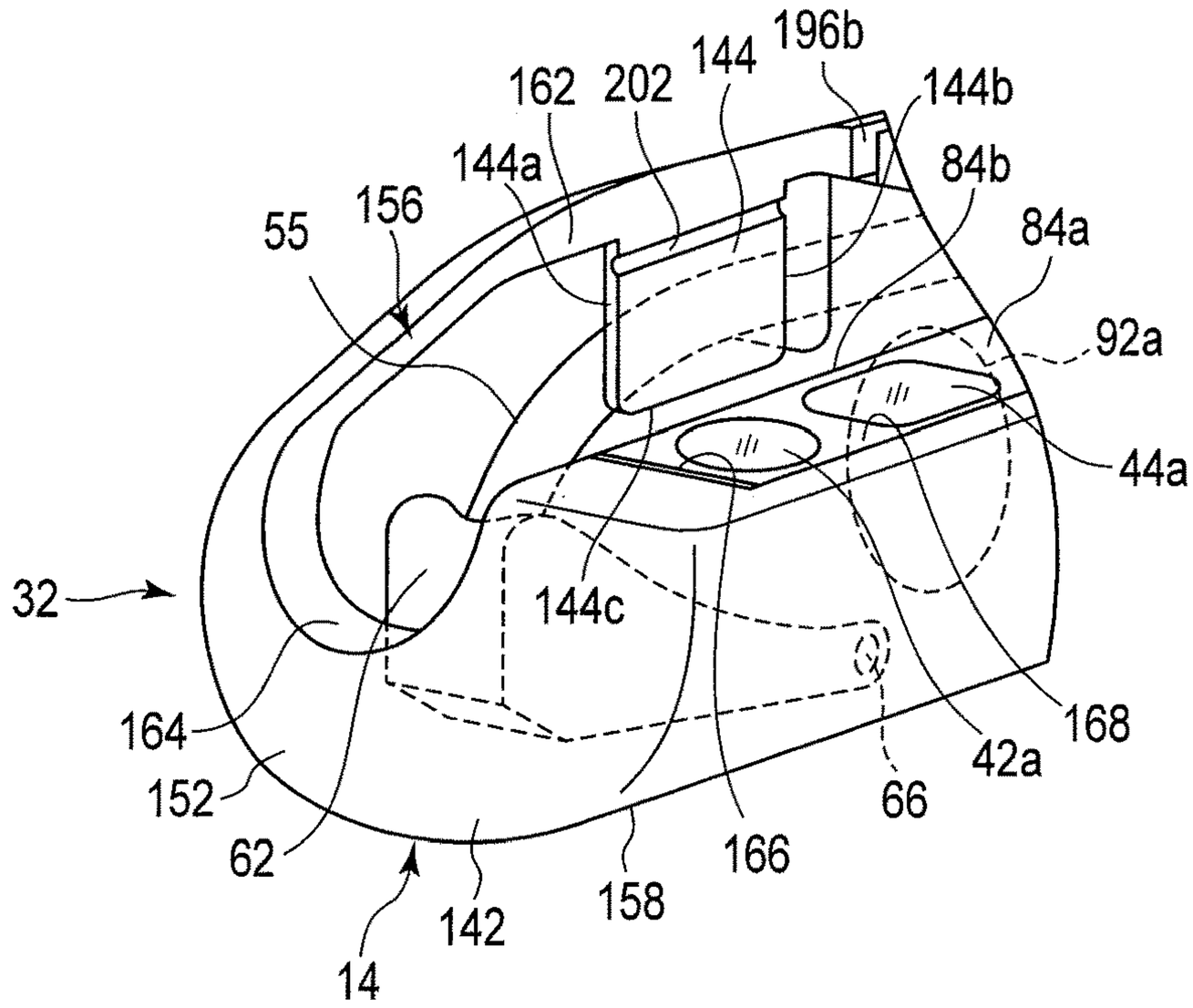



FIG. 11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166
158
142
14

FIG. 12

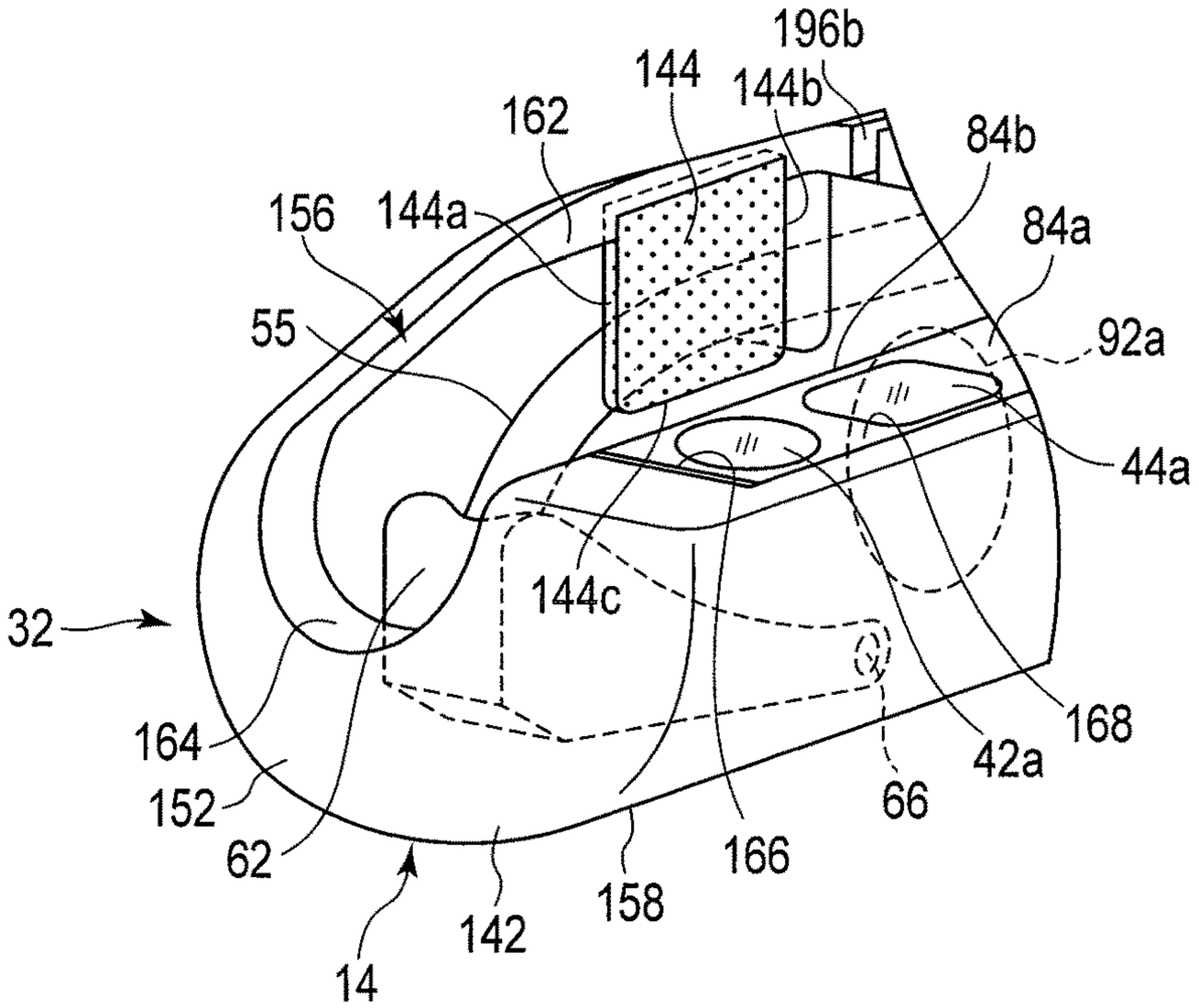
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FIG. 13

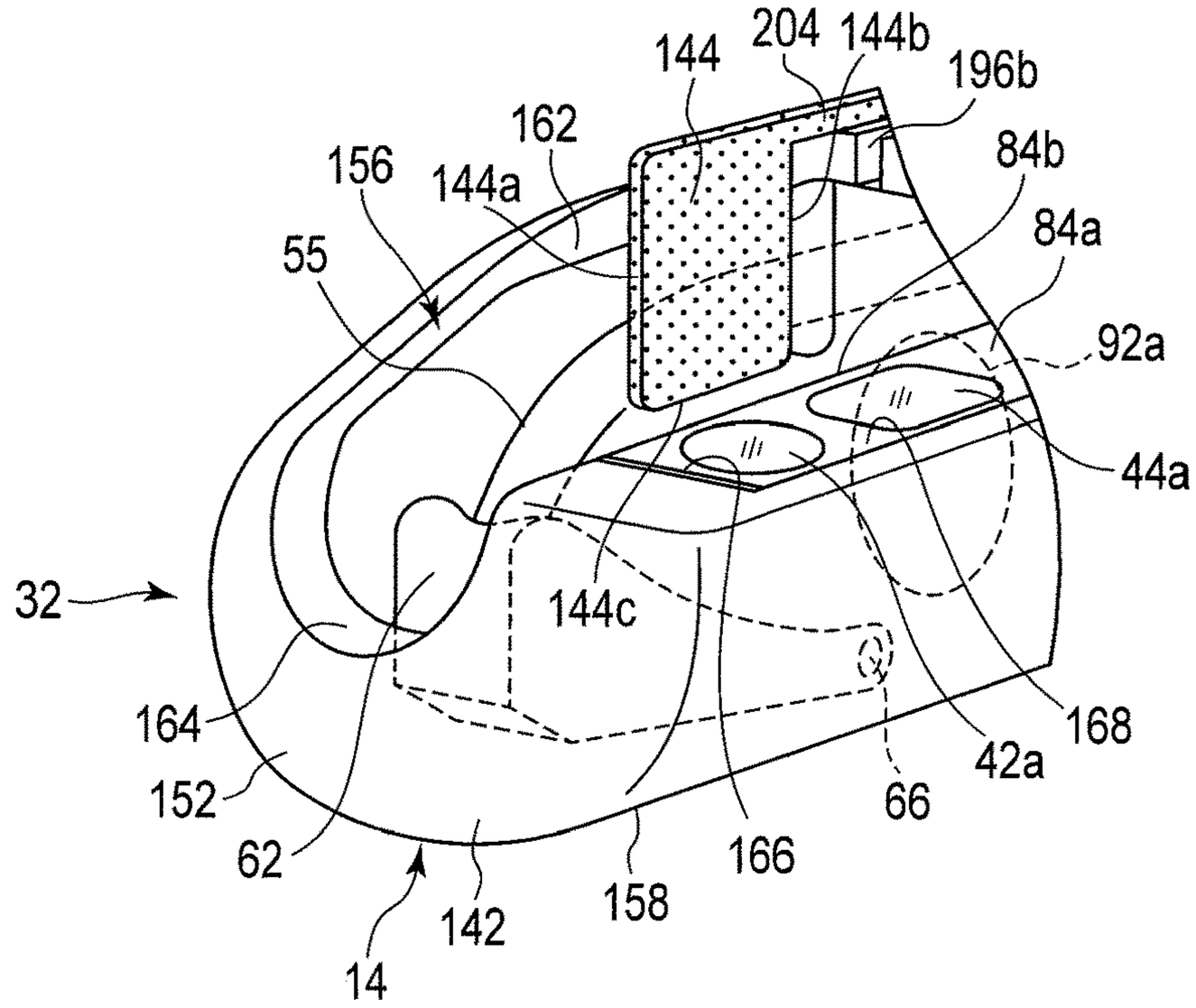
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FIG. 14

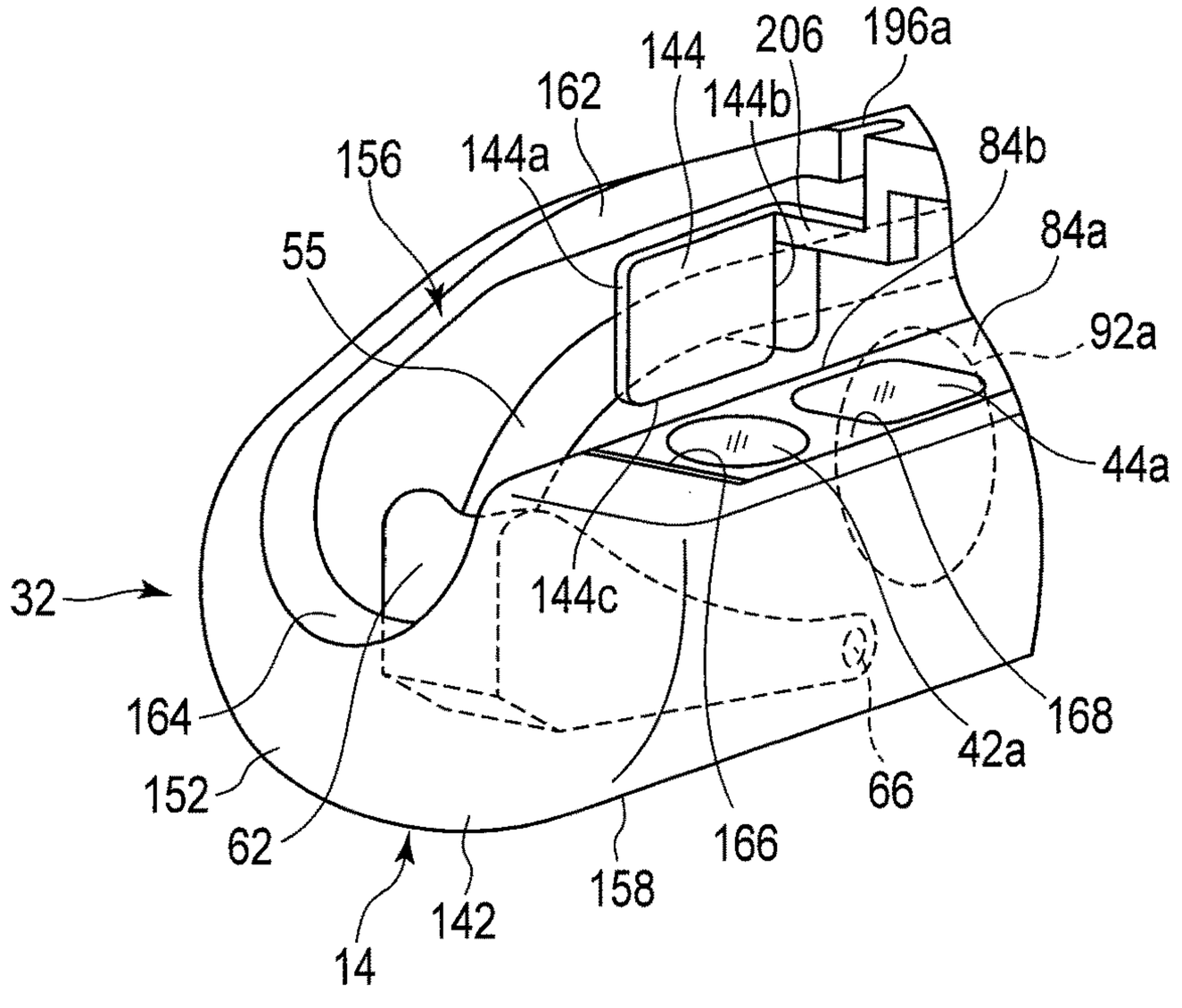
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FIG. 15

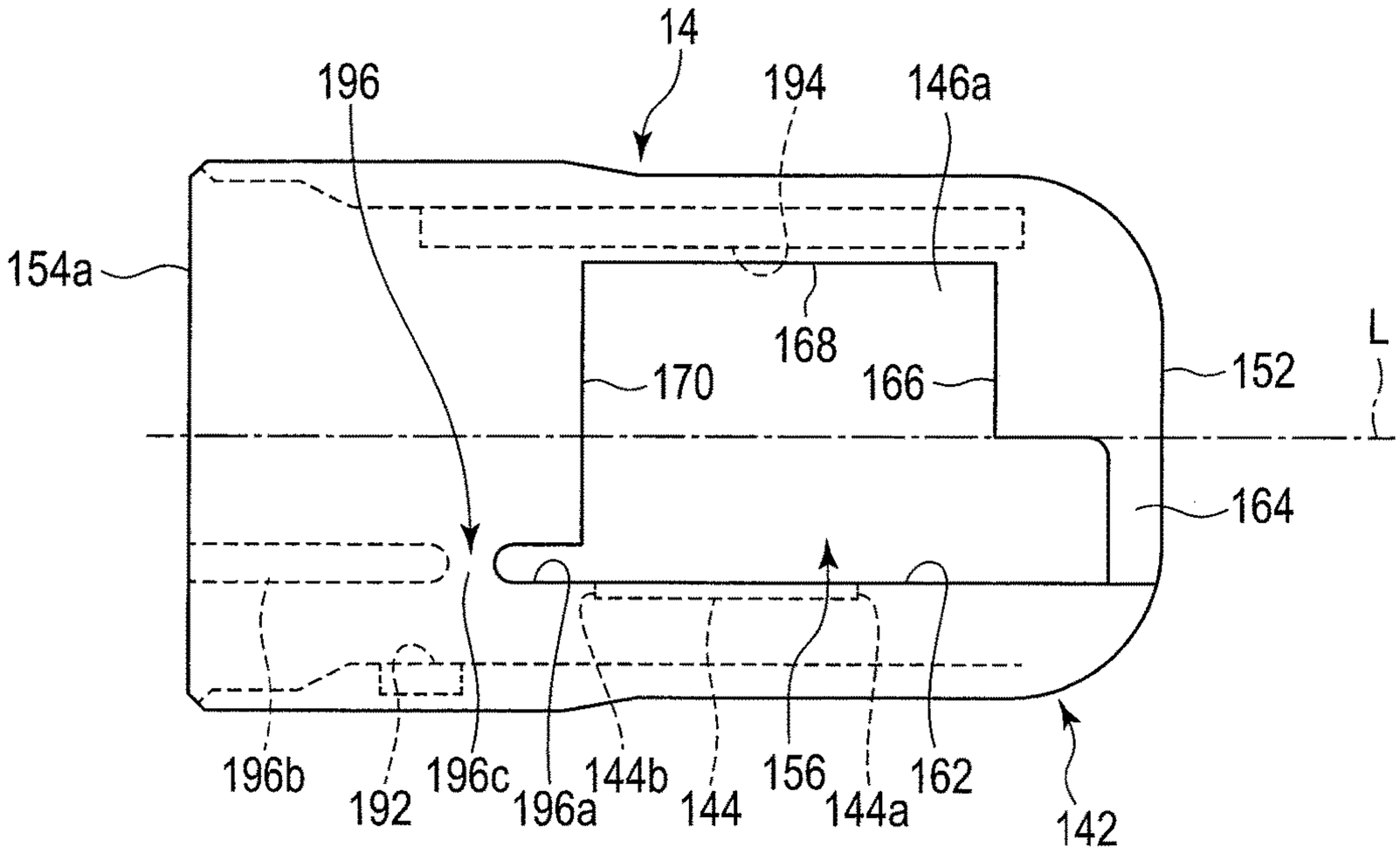


FIG. 16A

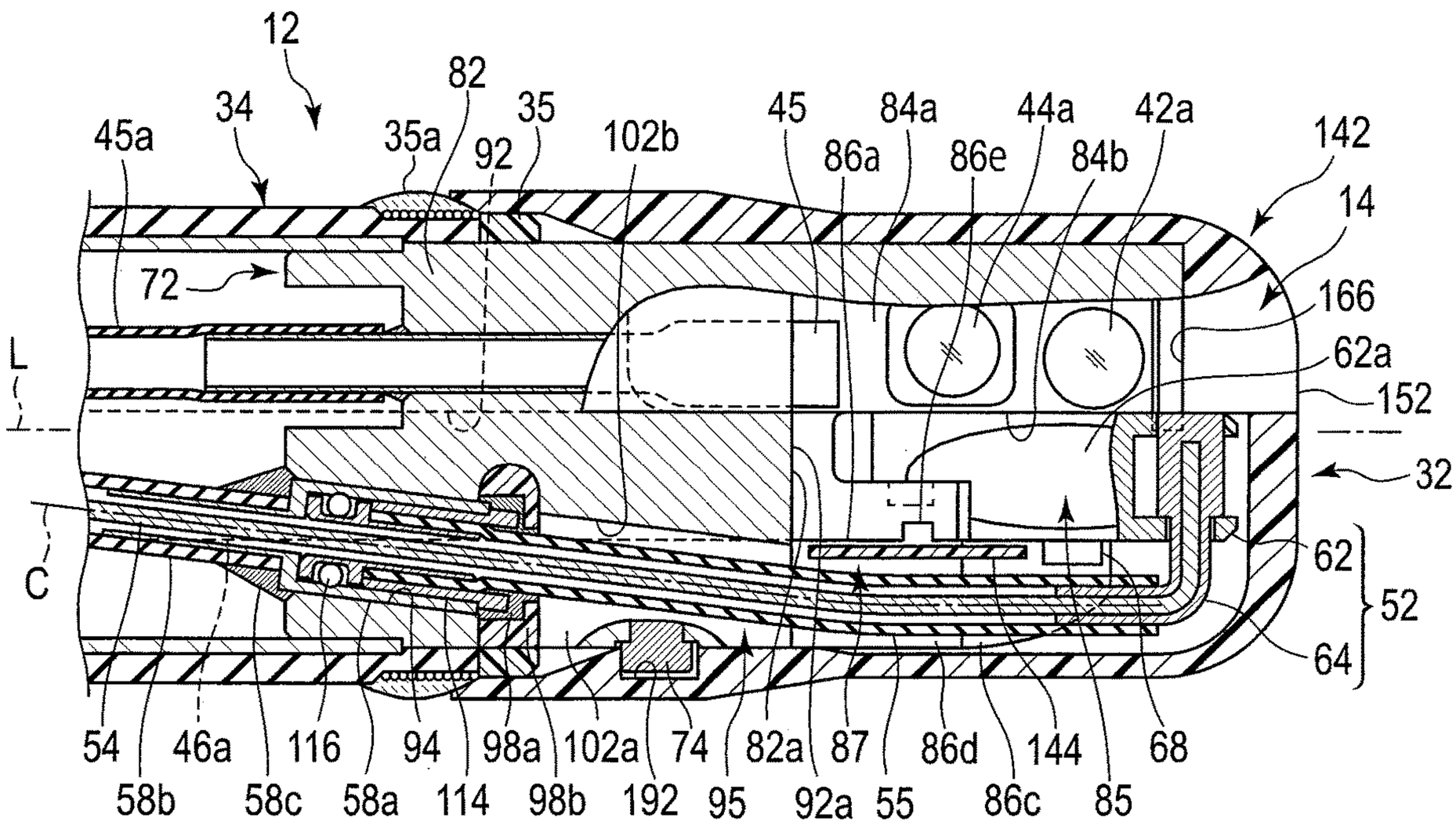


FIG. 16B

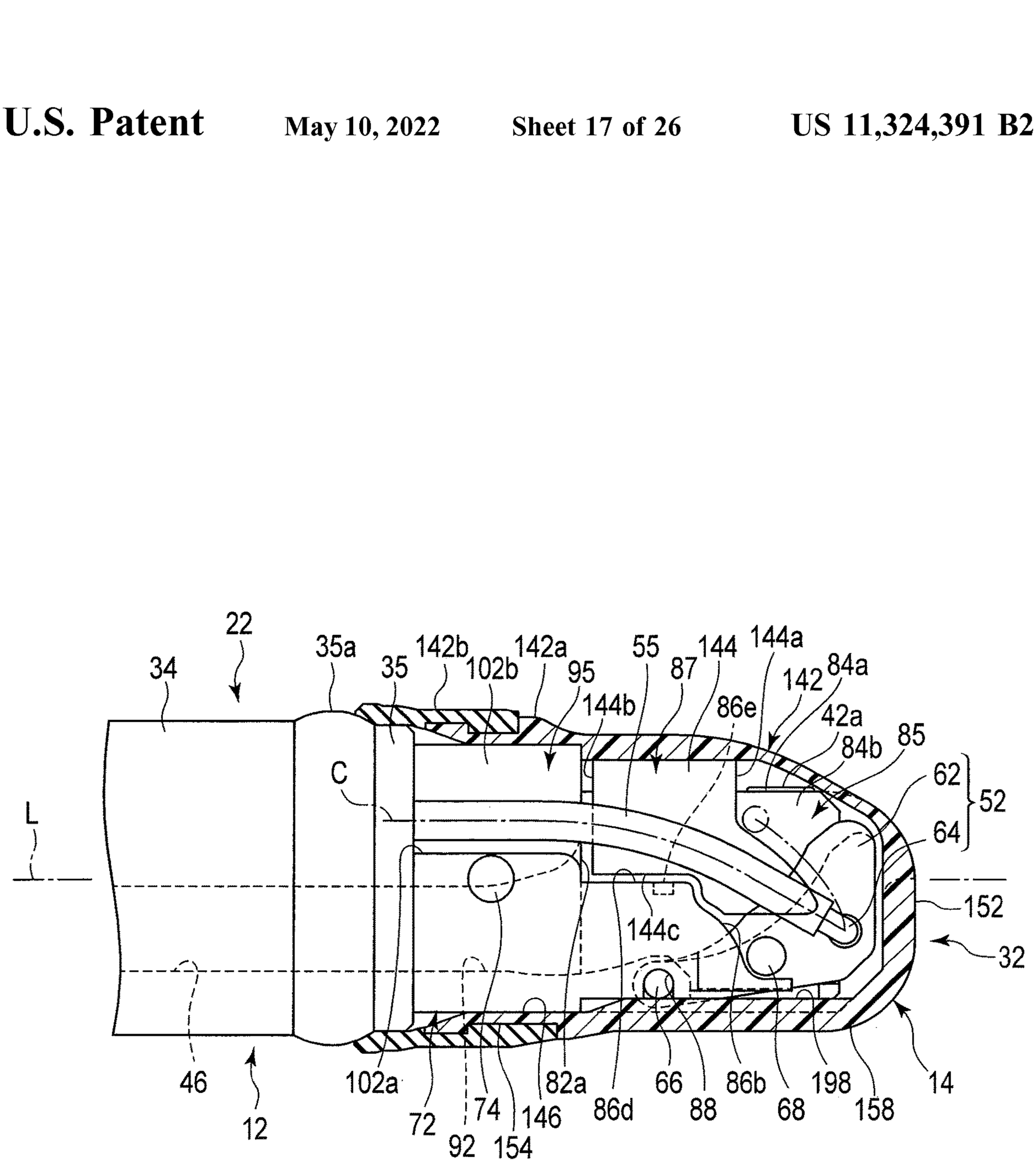
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FIG. 17

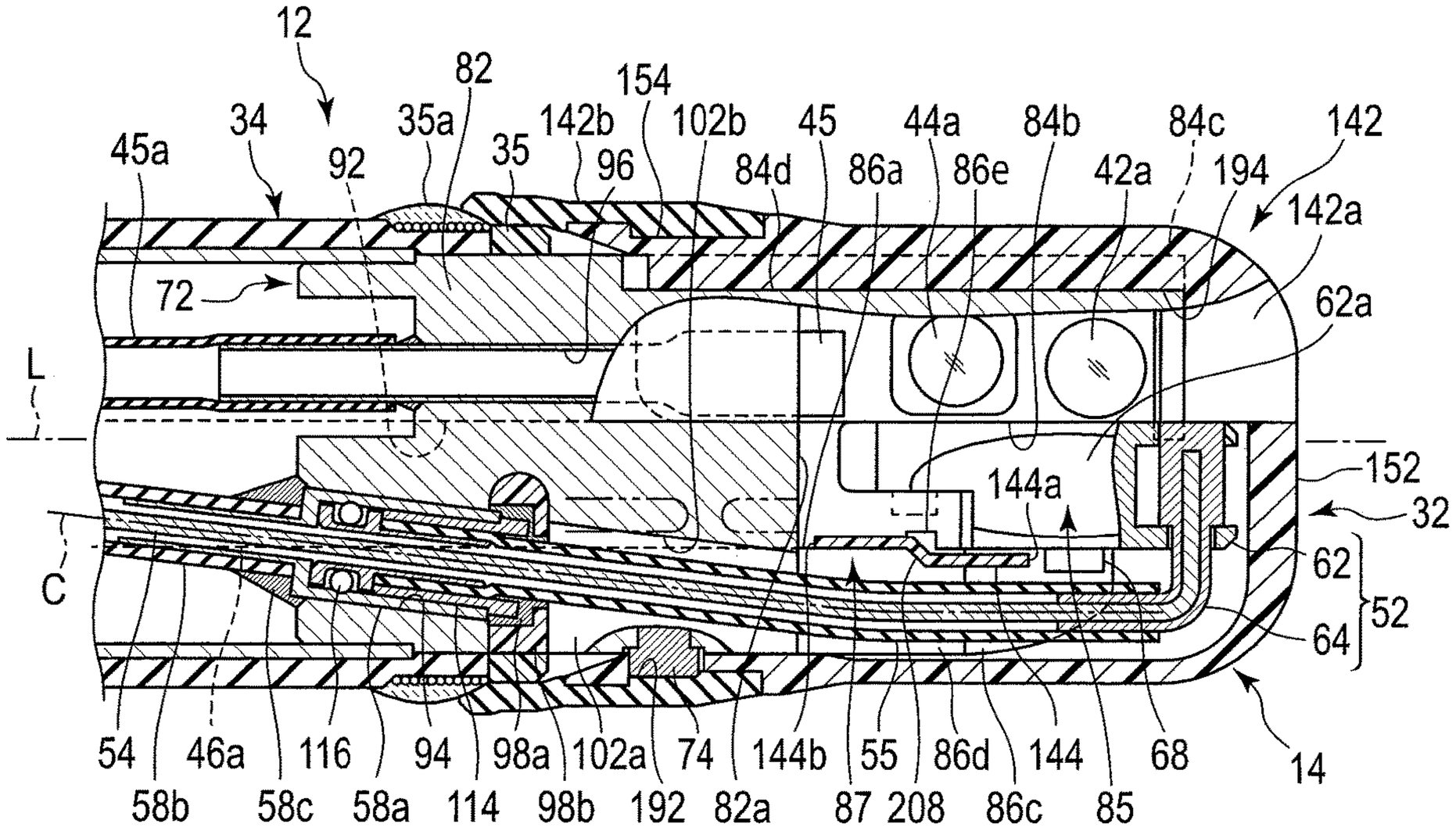
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FIG. 18

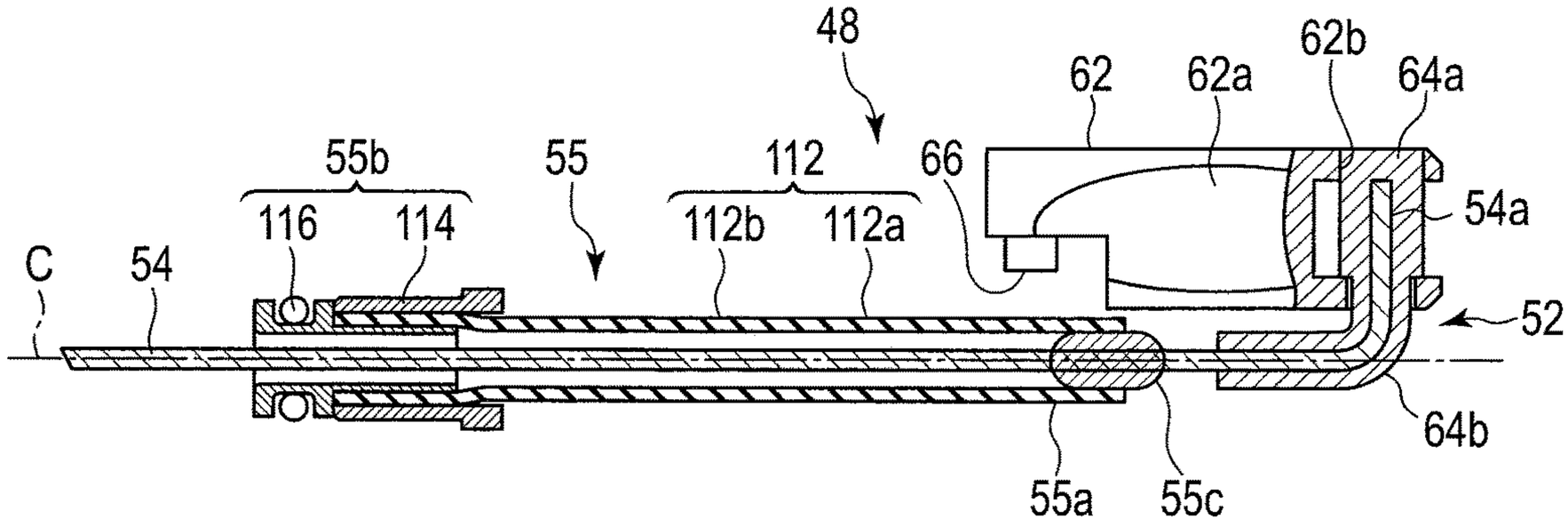
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FIG. 19

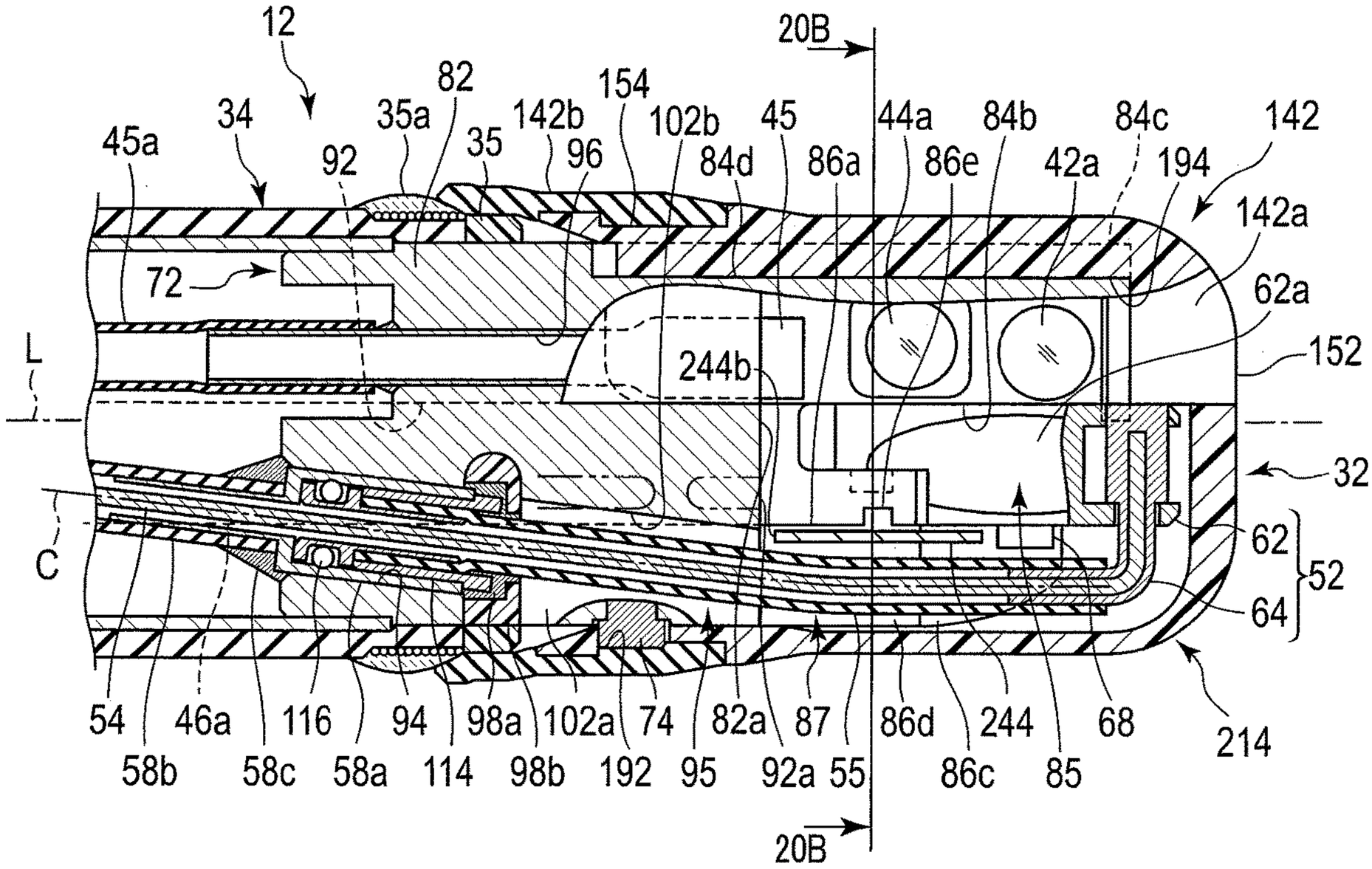



FIG. 20A

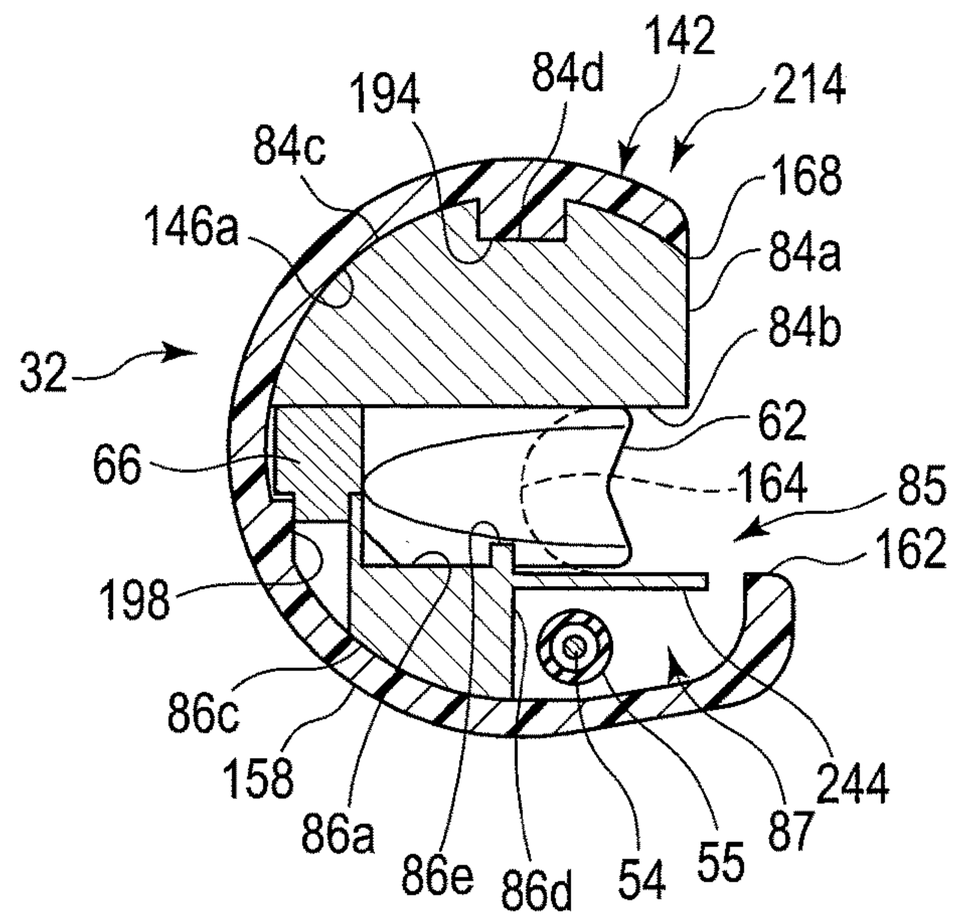



FIG. 20B

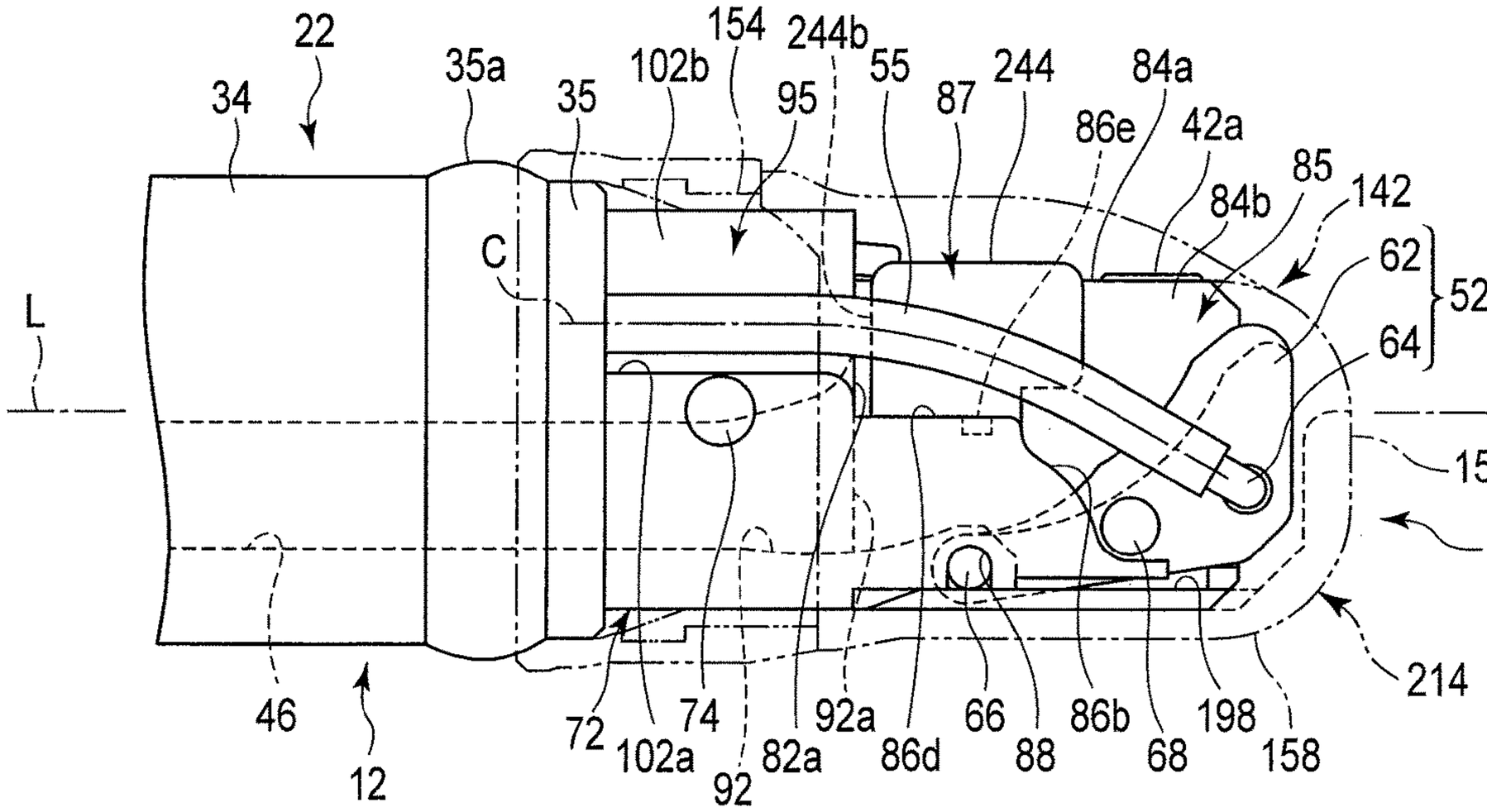



FIG. 21A

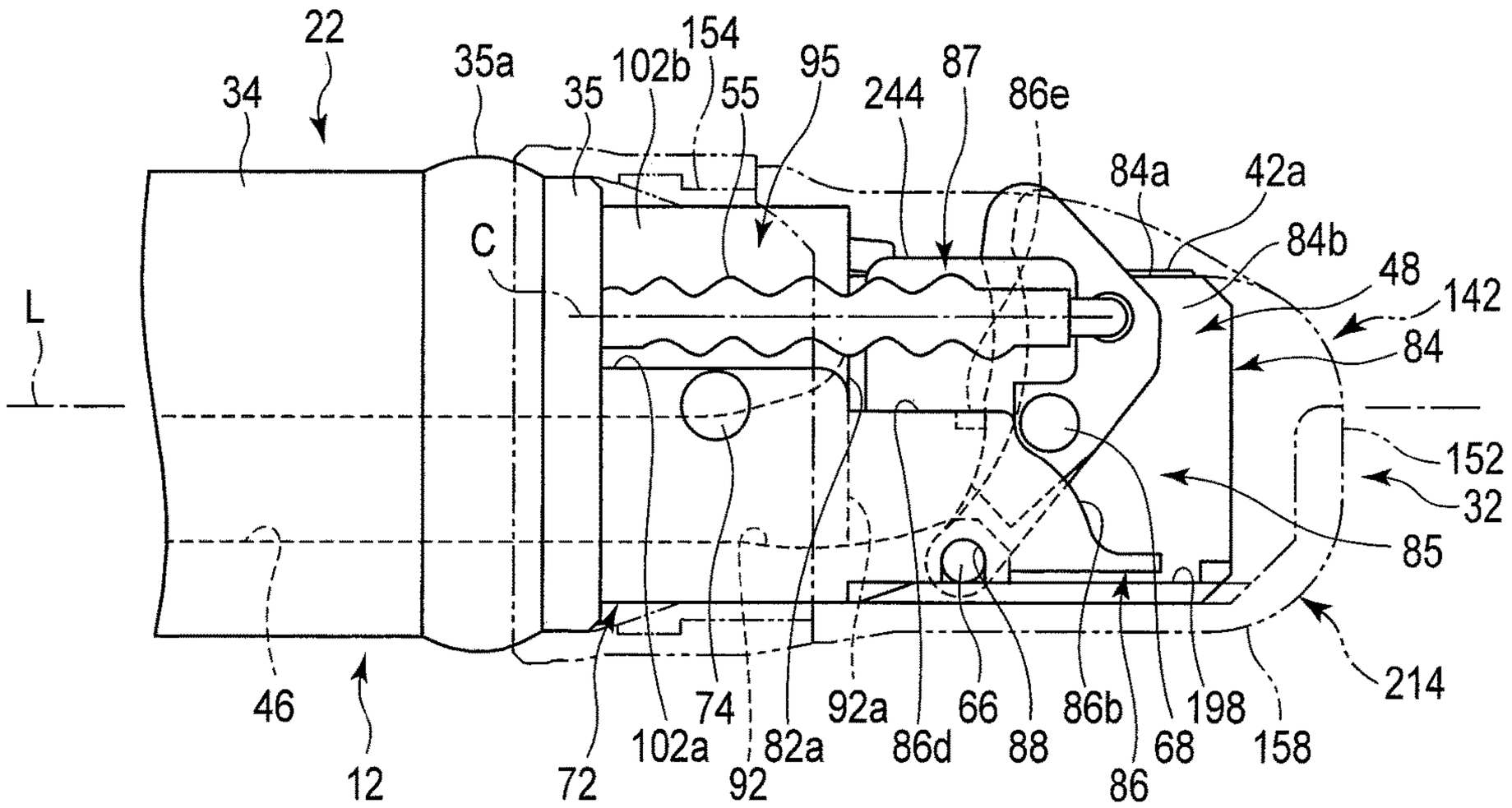



FIG. 21B

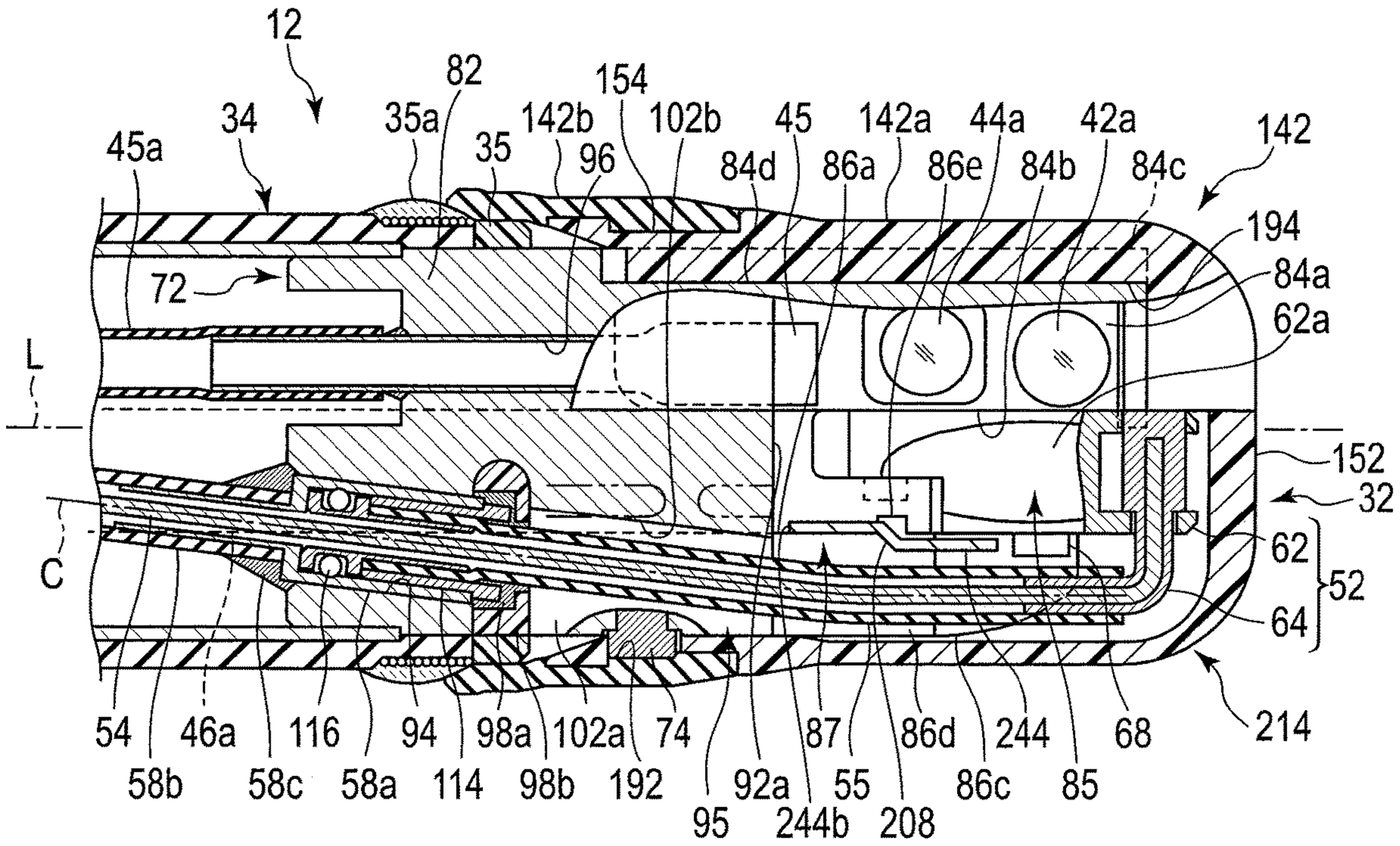

12
82
154
34
35a
142b
102b
45
142a
44a
42a
142
45a
35
96
84d
86a
86e
84b
84c
194
72
84a
62a
L
152
32
C
62
52
64
54
46a
116
94
98a
102a
74
87
86d
244
68
214
58b
58c
58a
114
98b
192
92a
55
86c
85
95
244b
208

FIG. 22

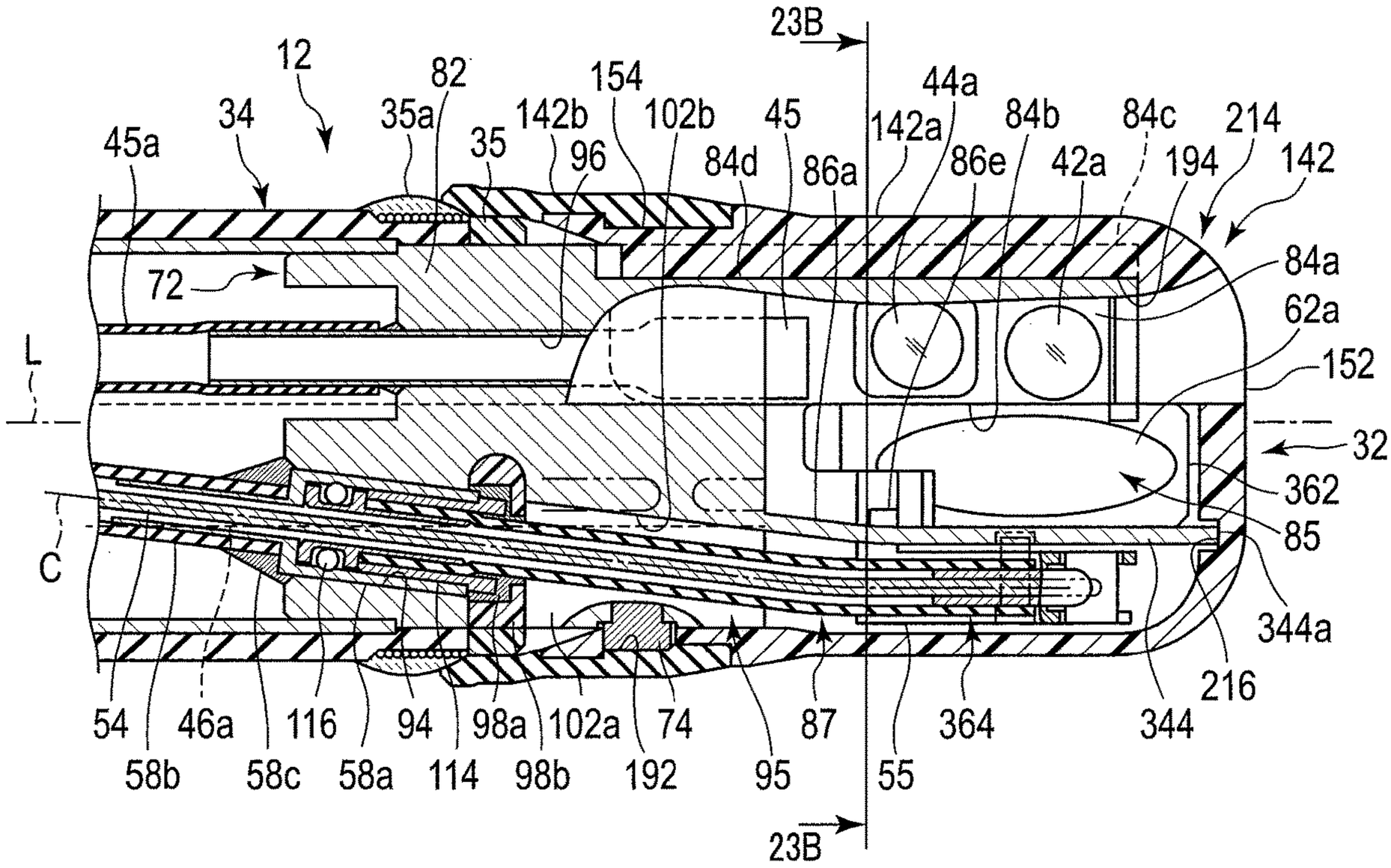



FIG. 23A

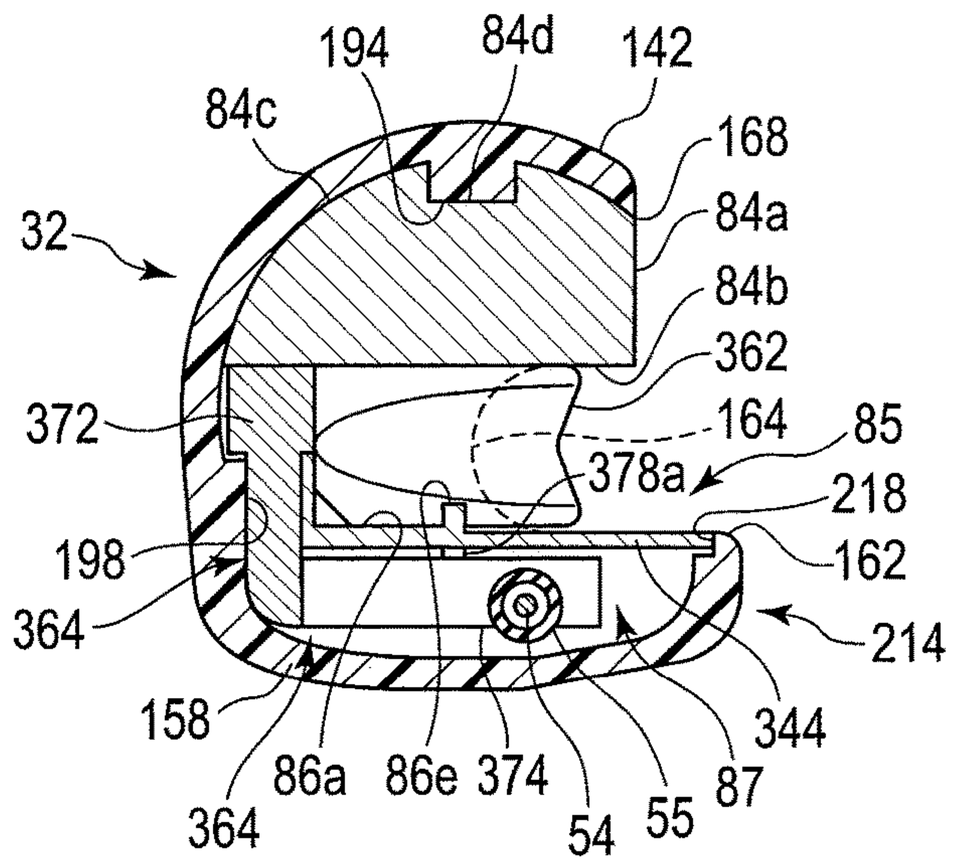



FIG. 23B

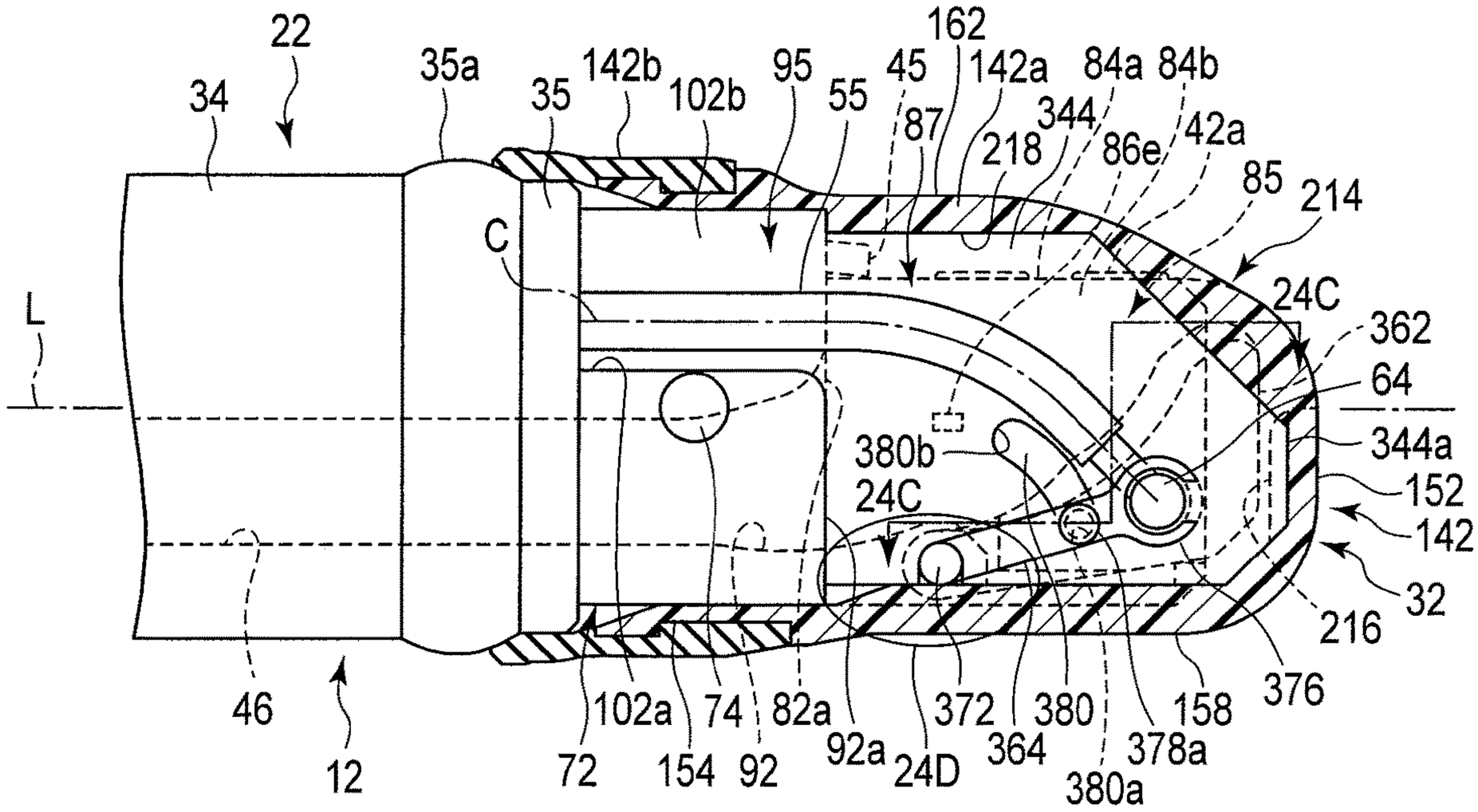



FIG. 24A

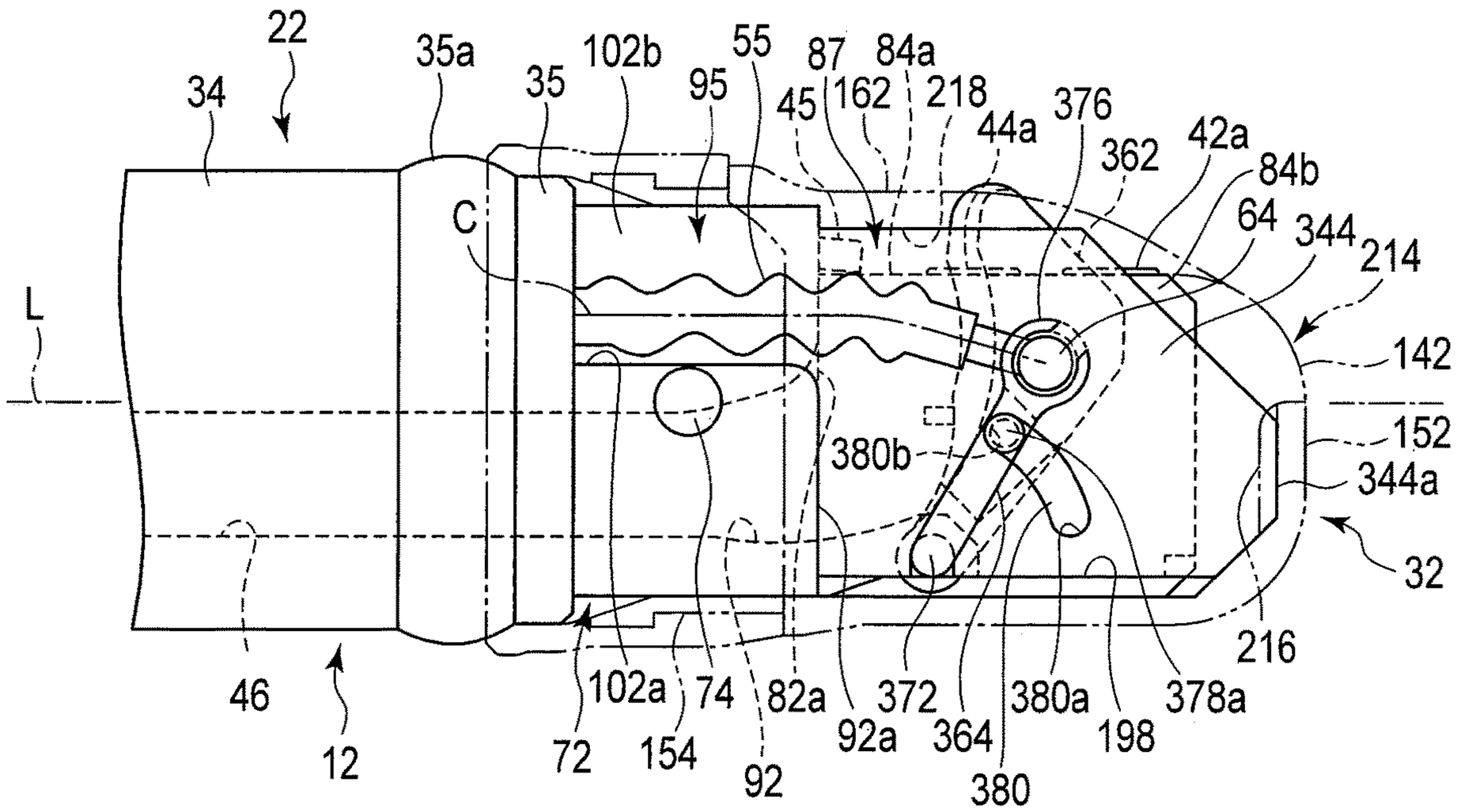



FIG. 24B

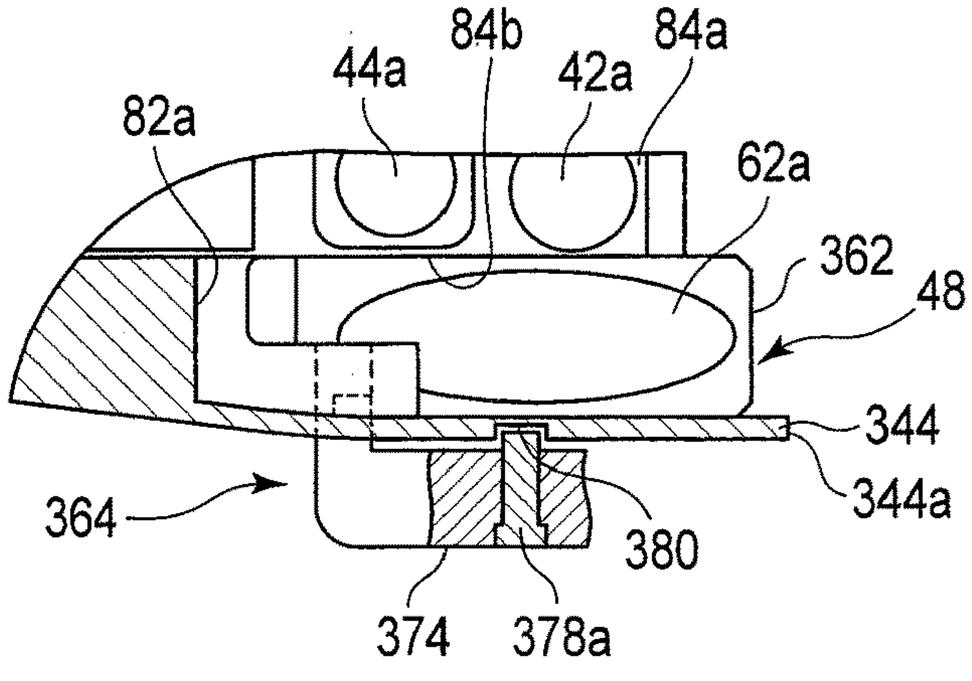



FIG. 24C

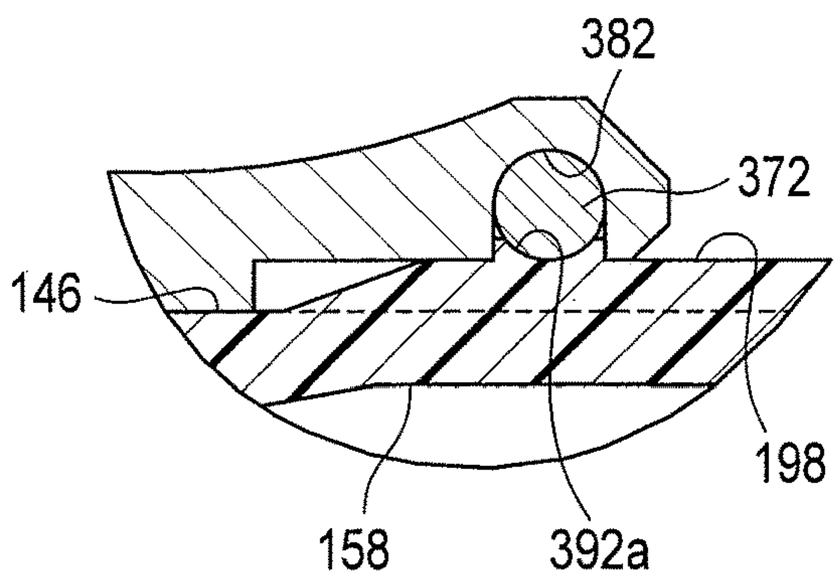



FIG. 24D

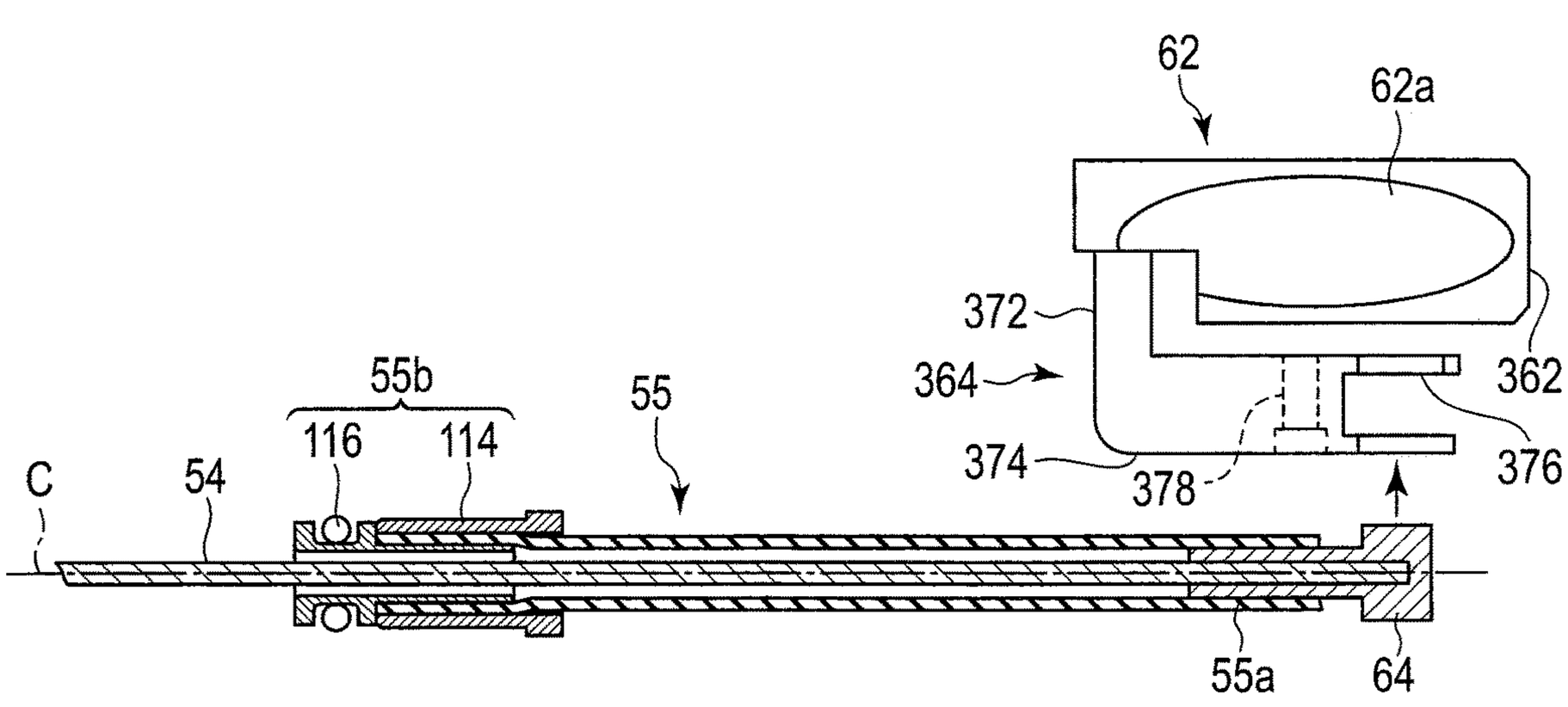
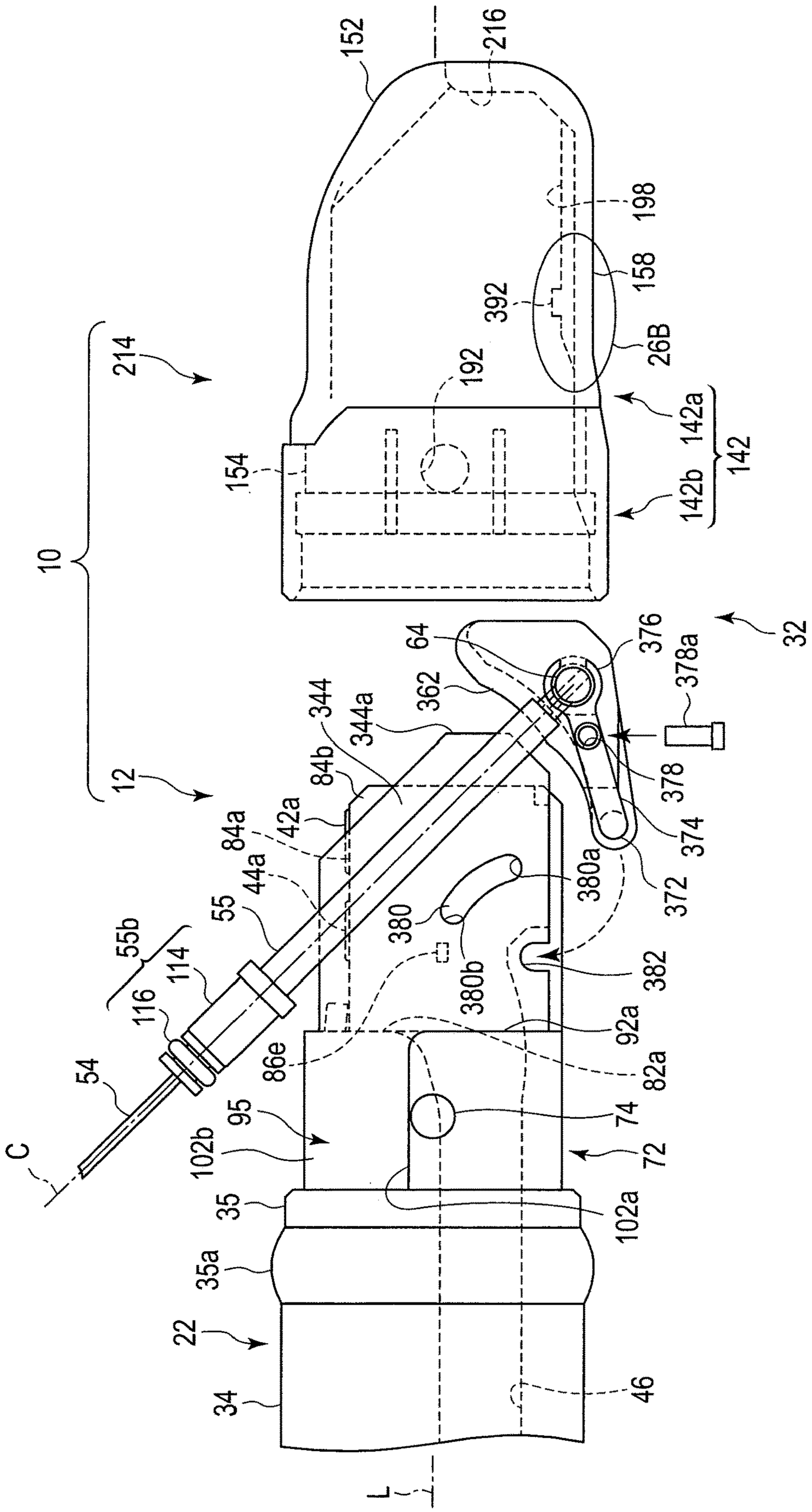



FIG. 25


152
216
198
158
392
26B
214
192
142a
142
154
142b
10
64
376
378a
32
362
344
344a
84b
12
42a
84a
378
374
44a
55
372
380a
55b
380
114
380b
382
116
92a
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82a
95
74
C
102b
72
35
102a
35a
22
34
46
L

FIG. 26A

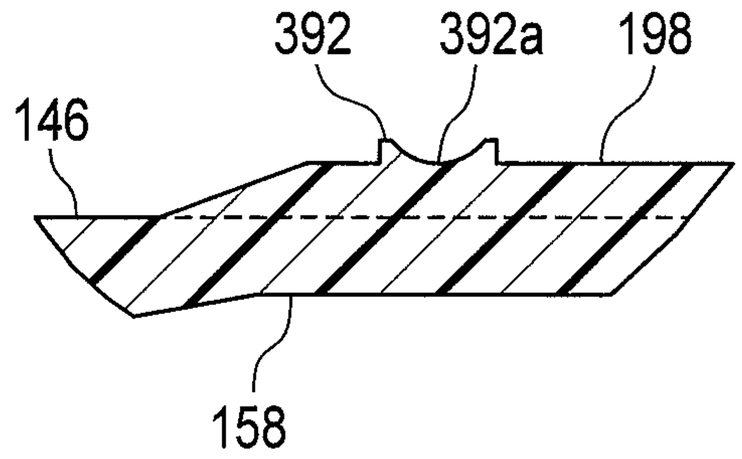


FIG. 26B

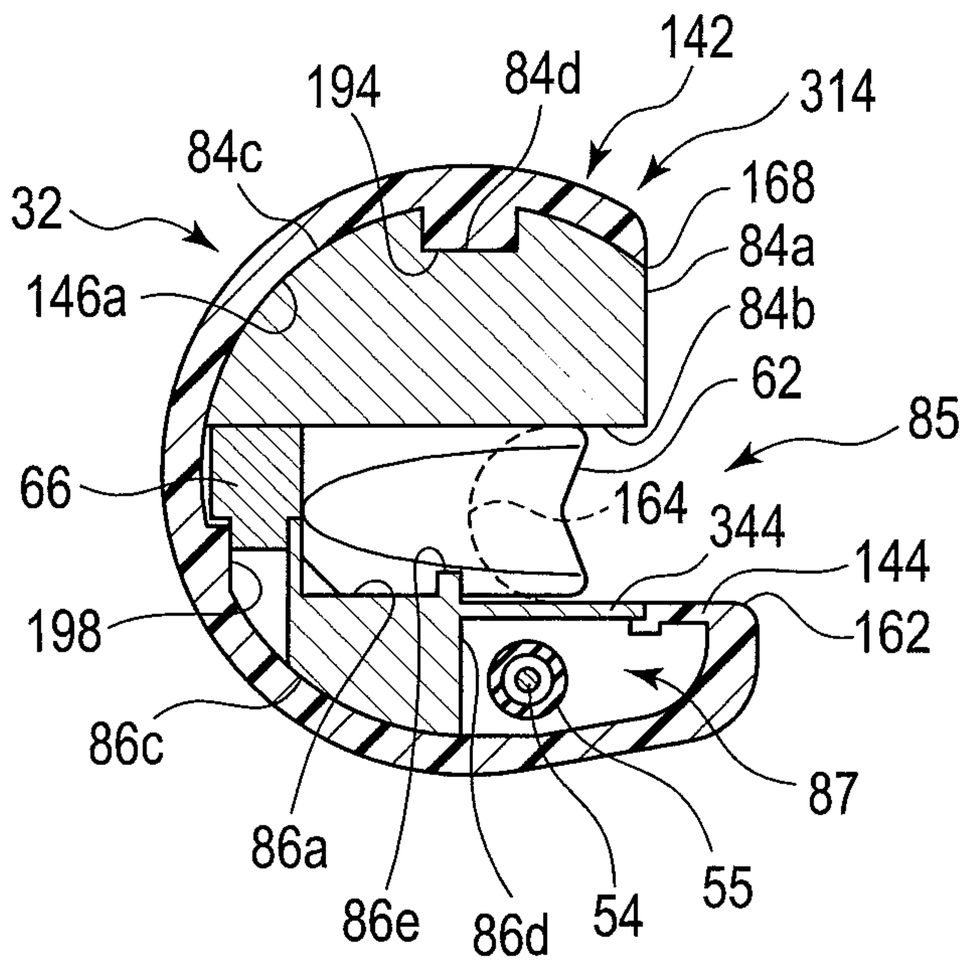


FIG. 27

# DISTAL-END COVER FOR ENDOSCOPE, AND ENDOSCOPE

## CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a Continuation Application of PCT Application No. PCT/JP2018/007021, filed Feb. 26, 2018 and based upon and claiming the benefit of priority from prior Japanese Patent Application No. 2017-067480, filed Mar. 30, 2017, the entire contents of all of which are incorporated herein by reference.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

This invention relates to a distal-end cover for endoscopes, and an endoscope.

### 2. Description of the Related Art

For example, Jpn. Pat. Appln. KOKAI Publication No. H06-315457 discloses an endoscope. The endoscope includes, on the distal end side of a channel through which an insertion tool such as a treatment instrument is inserted, a mechanism that is configured to change the direction of the distal end of the treatment instrument from a direction along the longitudinal axis of the insertion portion as needed. When a pulling member (elongated member) is moved in the axial direction by operating the raising portion of the endoscope, the raising portion coupled to the distal end of the pulling member disposed on the distal end portion of the insertion portion operates as appropriate around the axis of the support shaft as the pulling member moves.

## BRIEF SUMMARY OF THE INVENTION

According to one aspect of the present disclosure, there is provide a distal-end cover for an endoscope, attached to a distal frame portion of an insertion portion of an endoscope main body, which is to be inserted into a subject, along a longitudinal axis of the insertion portion. The distal-end cover includes: a cover main body attached to the distal frame portion; and a wall provided on the cover main body. The wall is provided between a tube and a raising portion provided on the endoscope main body, the wall being closer to the distal-end side along the longitudinal axis than a first opening edge portion of the distal frame portion forming part of a channel through which a treatment instrument is inserted when the cover main body is attached to an outside of the distal frame portion along the longitudinal axis of the insertion portion. The wall is deformed by the tube and an elongated member of the endoscope main body when the cover main body is removed from the outside of the distal frame portion. Where, the elongated member is disposed inside the tube, the elongated member is inserted through a second opening edge portion provided separately from the first opening edge portion, the elongated member is connected to the raising portion, and is configured to be moved along the longitudinal axis of the insertion portion to rotate the raising portion, one end of the tube is watertightly connected to one of the raising portion and the elongated member, and the other end of the tube is watertightly connected to the second opening edge portion, and the raising portion of the endoscope main body is rotatably attached to the distal frame portion, and is configured to raise the treatment instrument to protrude from the first opening edge portion.



Advantage of the invention will be set in the description of the follow, and in part will be obvious from the description or may be learned by practice of the invention. The advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out hereinafter.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The accompanying drawings, which are incorporated in and constituent a part of the specification, illustrate embodiments of the invention, and together with the general description given above and the detailed description of the embodiments given below, serve to explain the principles.

FIG. **1** is a schematic view showing an endoscope according to first and second embodiments each including a modification.

FIG. **2** is a schematic perspective view showing a distal-end portion and a bending portion of the insertion portion of the endoscope main body of the endoscope according to the first embodiment.

FIG. **3**A is a schematic partial sectional view showing a state in which the raising base of the distal-end portion of the insertion portion of the endoscope main body of the endoscope according to the first embodiment is disposed in a lowered position.

FIG. **3**B is a schematic sectional view taken along line **3**B-**3**B in FIG. **3**A.

FIG. **4**A is a schematic partial sectional view showing a state in which the raising base of the distal-end portion of the insertion portion of the endoscope main body of the endoscope according to the first embodiment is disposed in a raised position.

FIG. **4**B is a schematic sectional view taken along line **4**B-**4**B in FIG. **4**A.

FIG. **5** is a schematic partial sectional view different from that of FIG. **3**A, showing a state in which the raising base of the distal-end portion of the insertion portion of the endoscope main body of the endoscope according to the first embodiment is disposed in a lowered position.

FIG. **6**A is a schematic view showing a raising portion of the raising mechanism, a tube and a pulling member (elongated member) through which the tube is inserted with the distal end of the pulling member fixed to the coupling portion of the raising portion, which are disposed in the distal frame portion of the insertion portion of the endoscope main body of the endoscope according to the first embodiment.

FIG. **6**B is a schematic view showing a partial section of the raising base of the raising mechanism and sections of the tube and the pulling member, which are shown in FIG. **6**A.

FIG. **6**C is a schematic view showing the raising portion shown in FIGS. **6**A and **6**B from the back of FIG. **6**A.

FIG. **7**A is a schematic view showing a distal-end cover which is formed by combining two bodies and disposed at the distal-end portion of the insertion portion of the endoscope main body according to the first embodiment.

FIG. **7**B is a schematic sectional view taken along line **7**B-**7**B in FIG. **7**A.

FIG. **7**C is a schematic view showing the distal-end cover from the direction of arrow **7**C in FIG. **7**A.

FIG. **8**A is a schematic view showing a state in which the distal-end cover according to the first embodiment faces the

distal-end portion of the insertion portion of the endoscope main body to use the distal-end cover as an endoscope.

FIG. **8**B is a schematic perspective view showing a state in which the distal-end cover shown in FIG. **8**A faces the distal-end portion of the insertion portion of the endoscope main body.

FIG. **9**A is a schematic perspective view showing a state in which the distal-end cover shown in FIGS. **8**A and **8**B is attached to the distal-end portion of the insertion portion of the endoscope main body.

FIG. **9**B is a schematic perspective view showing a state in which the distal-end cover shown in FIG. **8**B is attached to the distal-end portion of the insertion portion of the endoscope main body.

FIG. **9**C is a schematic view showing a state in which the distal-end cover according to the first embodiment is attached to the distal-end portion of the insertion portion of the endoscope main body.

FIG. **10**A is a schematic partial sectional view showing a state of the tube inside which a raising portion and a pulling member for operating the raising portion are disposed with respect to the wall of the distal-end cover when the distal-end cover is attached to a distal-end portion of the insertion portion of the endoscope main body and the raising portion is disposed in the lowered position.

FIG. **10**B is a schematic partial sectional view showing a state of the tube inside which the raising portion and the pulling member for operating the raising portion are disposed with respect to the wall of the distal-end cover when the distal-end cover is attached to the distal-end portion of the insertion portion of the endoscope main body and the raising portion is disposed in the raised position.

FIG. **10**C is a schematic partial sectional view different from that of FIG. **10**A, showing a state in which the raising base of the distal-end portion of the insertion portion of the endoscope according to the first embodiment is disposed in a lowered position.

FIG. **10**D is a schematic sectional view taken along line **10**D-**10**D in FIG. **10**C.

FIG. **11** is a schematic partial sectional view showing a state of a tube inside which the raising portion and the pulling member for operating the raising portion are disposed with respect to the wall of the distal-end cover when the distal-end cover is attached to the distal-end portion of the insertion portion of the endoscope main body and the raising portion is disposed in the raised position, when the tube differs in property from the tube shown in FIG. **10**B.

FIG. **12** is a schematic perspective view showing a state in which a distal-end cover according to a first modification to the first embodiment is attached to the distal-end portion of the insertion portion of the endoscope main body shown in FIGS. **8**A and **8**B.

FIG. **13** is a schematic perspective view showing a state in which a distal-end cover according to a second modification to the first embodiment is attached to the distal-end portion of the insertion portion of the endoscope main body shown in FIGS. **8**A and **8**B.

FIG. **14** is a schematic perspective view showing a state in which a distal-end cover according to a third modification to the first embodiment is attached to the distal-end portion of the insertion portion of the endoscope main body shown in FIGS. **8**A and **8**B.

FIG. **15** is a schematic perspective view showing a state in which a distal-end cover according to a fourth modification to the first embodiment is attached to the distal-end portion of the insertion portion of the endoscope main body shown in FIGS. **8**A and **8**B.

FIG. **16**A is a schematic view showing a distal-end cover according to a fifth modification to the first embodiment, which is disposed at the distal-end portion of the insertion portion of the endoscope main body.

FIG. **16**B is a schematic partial sectional view showing a state in which the distal-end cover shown in FIG. **16**A is attached to the distal-end portion of the insertion portion of the endoscope main body.

FIG. **17** is a schematic sectional view showing a state of the tube inside which the raising portion and the pulling member for operating the raising portion are disposed with respect to the wall of a distal-end cover according to a sixth modification to the first embodiment when the distal-end cover is attached to the distal-end portion of the insertion portion of the endoscope main body and the raising portion is disposed in the lowered position.

FIG. **18** is a schematic partial sectional view showing a state in which a distal-end cover having a displacement portion on a wall thereof is attached to the distal-end portion of the insertion portion of the endoscope main body according to a seventh modification to the first embodiment.

FIG. **19** is a schematic view showing a modification to the partial section of the raising portion of the raising mechanism attached to the endoscope main body of the endoscope according to the first and second embodiments including the modifications, and a modification to the section of the tube and the pulling member of the raising mechanism.

FIG. **20**A is a schematic partial sectional view of an endoscope with a distal-end cover attached to an endoscope main body according to the second embodiment, showing a state in which a wall is formed on a distal frame portion of a distal-end portion of an insertion portion of the endoscope main body and a raising base is disposed in a lowered position.

FIG. **20**B is a schematic sectional view taken along line **20**B-**20**B in FIG. **20**A.

FIG. **21**A is a schematic view showing a state of the tube inside which the raising portion and the pulling member for operating the raising portion are disposed with respect to the wall when the raising portion of the distal-end portion of the insertion portion of the endoscope main body according to the second embodiment is disposed in the lowered position.

FIG. **21**B is a schematic view showing a state of the tube inside which the raising portion and the pulling member for operating the raising portion are disposed with respect to the wall when the raising portion of the distal-end portion of the insertion portion of the endoscope main body according to the second embodiment is disposed in the raised position.

FIG. **22** is a schematic partial sectional view of an endoscope with a distal-end cover attached to an endoscope main body according to a first modification to the second embodiment, showing a state in which a wall is formed on a distal frame portion of a distal-end portion of an insertion portion of the endoscope main body and a raising base is disposed in a lowered position.

FIG. **23**A is a schematic partial sectional view of an endoscope with a distal-end cover attached to an endoscope main body according to a second modification to the second embodiment, showing a state in which a wall is formed on a distal frame portion of a distal-end portion of an insertion portion of the endoscope main body and a raising base is disposed in a lowered position.

FIG. **23**B is a schematic sectional view taken along line **23**B-**23**B in FIG. **23**A.

FIG. **24**A is a schematic partial sectional view showing a state of the tube inside which the raising portion and the pulling member for operating the raising portion are dis-

posed with respect to the wall of the distal frame portion when the distal-end cover is attached to a distal-end portion of the insertion portion of the endoscope main body and the raising portion is disposed in the lowered position.

FIG. **24**B is a schematic view showing a state of the tube inside which the raising portion and the pulling member for operating the raising portion are disposed with respect to the wall of the distal frame portion when the raising portion is disposed in the raised position.

FIG. **24**C is a schematic sectional view taken along line **23**C-**23**C in FIG. **24**A.

FIG. **24**D is a schematic partial sectional view showing a relationship between the fitting arm and the raising base main body of the raising mechanism with respect to the wall in the enlarged position indicated by symbol **24**D in FIG. **24**A.

FIG. **25** is a partial sectional view showing the raising portion of the raising mechanism, the pulling member to the distal end of which a coupling portion is coupled, and the tube inside which the pulling member is disposed in the second modification to the second embodiment.

FIG. **26**A is a schematic view showing a state in which the raising mechanism is attached to the distal frame portion of the insertion portion of the endoscope main body according to the second modification to the second embodiment, which is provided with a wall, and then the distal-end cover is going to be attached thereto.

FIG. **26**B is an enlarged sectional view of the position indicated by symbol **26**B in FIG. **26**A.

FIG. **27** is a schematic sectional view showing a state in which the distal-end cover according to the first embodiment is attached to the distal-end portion of the endoscope main body according to the second embodiment.

## DETAILED DESCRIPTION

Embodiments for carrying out the invention will be described below with reference to the drawings.

### First Embodiment

A first embodiment will be described with reference to FIGS. **1** to **11**.

As shown in FIG. **1**, an endoscope **10** according to the embodiment includes an endoscope main body **12** and a distal-end cover **14**. In the present embodiment, the cover **14** is described mainly as being formed as a disposable type. If the cover **14** is attached to the endoscope main body **12** and so formed that it can be cleaned, disinfected and sterilized as appropriate, the attachment to the endoscope main body **12** may be maintained. Thus, the cover **14** described here is not limited to a disposable type.

The endoscope main body **12** includes an insertion portion **22** to be inserted into a subject, an operation portion **24** provided at the proximal end of the insertion portion **22** and grasped by a user, and a universal cord **26** extending from the operation portion **24**. The distal-end cover **14** is attached to the distal end of the insertion portion **22** along its longitudinal axis L.

The longitudinal axis L of the insertion portion **22** is defined by the distal end and the proximal end of the insertion portion **22**. The insertion portion **22** includes a distal-end portion **32** (see FIG. **2**), a bending portion **34** and a tube portion **36**, which are arranged in order from the distal end to the proximal end. The foregoing distal-end cover **14** is attached to the distal-end portion **32** to cover part of the outer circumferential surface of the distal-end portion **32**. The tube portion **36** may be what is called a flexible scope having flexibility or what is called a rigid scope that maintains its straight state and has resistance to bending. The bending portion **34** can be bent in a plurality of directions such as two or four directions by operating a knob **24***a* of the operation portion **24** using a known mechanism. When a lever (raising state adjustment portion) **56** is operated, a pulling member **54** to be described later moves along the longitudinal axis L of the insertion portion **22**. Accordingly, a raising portion **52** to be described later rotates relative to a distal frame portion **72** of the insertion portion **22**. The raising portion **52** can be moved between a lowered position (initial position) shown in FIG. **3**A and a maximum raised position shown in FIG. **4**A. The raising portion **52** is usually located in the lowered position shown in FIG. **3**A.

As shown in FIGS. **2**, **3**A, **4**A and **5**, an annular electrical insulating member **35** is fixed to the distal end of the bending portion **34**. The insulating member **35** is disposed on the outer circumferential surface of a block-shaped distal frame portion **72** to be described later. A thread wound portion **35***a* is formed at a position adjacent to the proximal end side of the insulating member **35**.

As shown in FIG. **1**, the endoscope main body **12** includes an illumination optical system **42**, an observation optical system **44** and a treatment instrument insertion channel **46**. In addition, the endoscope main body **12** includes an air-supply/water-supply mechanism and a suction mechanism (not shown). The air-supply/water-supply mechanism includes a nozzle **45** and a tube **45***a* (see FIG. **5**), which are to be described later, on its distal end and is operated by a button **25***a* of the operation portion **24** shown in FIG. **1**. The suction mechanism communicates with the channel **46** and is operated by a button **25***b* of the operation portion **24** shown in FIG. **1**.

The illumination optical system **42** and the observation optical system **44** are disposed inward from the distal-end portion **32**, bending portion **34**, tube portion **36**, operation portion **24** and universal cord **26** of the insertion portion **22** of the endoscope main body **12**. As shown in FIG. **2**, the illumination optical system **42** includes an illumination window **42***a* on the distal-end portion **32**. The observation optical system **44** includes an observation window **44***a* on the distal-end portion **32**. The following is a description of a case where the observation optical system **44** is formed as a side-viewing type for observation in a direction orthogonal to the longitudinal axis L. However, it may be formed as an oblique-viewing type for observation in a direction away from the longitudinal axis L. The side-viewing type and oblique-viewing type observation optical systems **44** are each known. The endoscope main body **12** including the side-viewing type observation optical system **44** will be described below.

As shown in FIGS. **2**, **3**A, **4**A and **5**, the distal end of the channel **46** is opened in the distal frame portion **72** of the insertion portion **22** of the endoscope main body **12**. As shown in FIG. **1**, the proximal end of the channel **46** is opened near the proximal-end portion of the tube portion **36** of the insertion portion **22** or in the operation portion **24**. In this case, as shown in FIG. **1**, the proximal end of the channel **46** has an opening (not shown) in the operation portion **24**, and a forceps plug **46***b* is detachable to the opening through a mouth ring (not shown). As shown in FIGS. **3**A, **4**A and **5**, the distal end of a tube **46***a* of the channel **46** is fixed to the distal frame portion **72** through a mouth ring **46***c*. Note that the tube **46***a* of the channel **46** branches to a known suction path **46***d* inside, for example, the operation portion **14**. The suction path **46***d* is coupled to

the button **25***b*. Pressing the button **25***b* will discharge sucked substances from a distal-end opening **92***a* (to be described later) of the distal end of the channel **46** through the mouth ring **46***c*, tube **46***a*, suction path **46***d* and universal cord **26**.

As described above, in this embodiment, the distal-end portion **32** is formed as a side-viewing type with a different observation direction relative to a direction along the longitudinal axis L of the insertion portion **22**. As shown in FIGS. **2** to **6***c*, the endoscope main body **12** includes a raising mechanism **48** that can properly adjust the direction of a treatment instrument (not shown) or the like inserted into the channel **46** at the distal-end portion **32** so as to set the treatment instrument in the visual field of the observation optical system **44**.

The distal end of the raising mechanism **48** is located in the distal-end portion **32** of the insertion portion **22** of the endoscope main body **12**, and the proximal end thereof is located in the operation portion **24** (see FIG. **1**). The raising mechanism **48** includes a raising portion **52** supported by the distal frame portion **72**, an elongated member (to be referred to as a pulling member hereinafter) **54** (see FIG. **3**A, etc.) that moves in the axial direction to actuate the raising portion **52**, and the lever **56** (see FIG. **1**) supported by the operation portion **24**.

The raising portion **52** is provided on the distal-end portion **32** of the insertion portion **22**. The raising portion **52** is rotatably attached to the distal frame portion **72**. The raising portion **52** is provided on the distal-end side of the mouth ring **46***c* and a first cylindrical surface (first opening edge portion) **92** to be described later and the distal-end side of the mouth ring **58***a* and a second cylindrical surface (second opening edge portion) **94** to be described later to operate relative to the distal frame portion **72**. The raising portion **52** can adjust the direction of the distal-end portion of the treatment instrument, such as raising of the treatment instrument projected from the first cylindrical surface **92** of the channel **46**.

As the pulling member **54**, for example, a wire and a rod-like member (rod) having flexibility are used. The pulling member **54** extends to the proximal-end side of the distal frame portion **72** through the passage (mouth ring **58***a*) (see FIG. **3**A, etc.) of the distal frame portion **72** of the distal-end portion **32** of the insertion portion **22**. The pulling member **54** is thus inserted through the second opening edge portion **94** of the distal frame portion **72**. The pulling member **54** then extends to the operation portion **24** through the interiors of the bending portion **34** and the tube portion **36**. The proximal end (the other end) of the pulling member **54** is connected to the lever **56** of the operation portion **24**. The length of the pulling member **54** is adjusted. The distal end (one end) of the pulling member **54** is connected to the raising portion **52**. In other words, a distal-end portion **54***a* of the pulling member **54** on its distal-end side is connected to the raising portion **52**. Note that the raising portion **52** is part of the distal-end portion **32**. In addition, the distal-end portion **54***a* of the pulling member **54** and its neighboring portion are also part of the distal-end portion **32**.

The raising portion **52** includes a raising base **62** including a guide path **62***a* for treatment instruments and a coupling portion **64** coupled to the raising base **62**. The raising base **62** is formed into an almost triangular prism shape. The raising base **62** is provided with a pivot shaft **66** that is orthogonal to, for example, the longitudinal axis L and also orthogonal to the observation direction and a guide pin **68** that is supported on a guide surface **86***b*, which is to be described later, to guide the raising base **62** so as to allow it to move in a predetermined range. The raising base **62** is preferably formed integrally with the pivot shaft **66** and the guide pin **68**. The raising base **62** rotates on the pivot shaft **66** that is orthogonal to, for example, the longitudinal length L. The raising portion **52** can thus rotate on the pivot shaft **66** relative to the distal frame portion **72**. Note that the pivot shaft **66** of the raising base **62** of the raising portion **52** need not always be orthogonal to the longitudinal axis L and is allowed to shift as needed. The axial direction of the pivot shaft **66** of the raising base **62** of the raising portion **52** need not always be orthogonal to the observation direction of the observation optical system **44** and is allowed to shift as needed.

As shown in FIGS. **2** to **5**, the distal frame portion **72** is provided on the distal-end side of the insertion portion **22** along the longitudinal axis L. The distal frame portion **72** is formed like a block. The distal frame portion **72** is formed by, for example, cutting a cylindrical column made of a hard material such as a metal like stainless steel or a hard resin. The distal frame portion **72** generally includes an almost columnar base **82** and first and second convex portions **84** and **86** extending from the distal end **82***a* of the base **82** to the distal-end side along the longitudinal axis L. The outer circumference of the base **82** of the distal frame portion **72** is covered by the distal-end portion of a flexible tube made of rubber on the outermost circumference of the bending portion **34**. The thread wound portion **35***a* brings the distal-end portion of the flexible tube of the bending portion **34** into tight contact with the outer circumference of the base **82** of the distal frame portion **72**. The insulating member **35** is disposed at the distal end of the flexible tube of the bending portion **34**.

The first convex portion **84** is provided with the illumination window **42***a* of the illumination optical system **42** and the observation window **44***a* of the observation optical system **44**. The illumination window **42***a* of the illumination optical system **42** and the observation window **44***a* of the observation optical system **44** are directed in a direction orthogonal to the longitudinal axis L. The base **82** is provided with the nozzle **45**. The nozzle **45** is provided on the proximal-end side of the illumination window **42***a* of the illumination optical system **42** and the observation window **44***a* of the observation optical system **44**. The opening of the nozzle **45** is directed to the illumination window **42***a* of the illumination optical system **42** and the observation window **44***a* of the observation optical system **44**. The nozzle **45** can discharge a liquid such as physiological saline toward the observation window **44***a* and illumination window **42***a* and blow off deposits on the observation window **44***a* and illumination window **42***a* by supplying air.

The first convex portion **84** includes an arrangement surface **84***a* on which the illumination window **42***a* of the illumination optical system **42** and the observation window **44***a* of the observation optical system **44** are arranged, a defining surface (flat surface) **84***b* that defines the moving direction of the raising base **62**, and an outer circumferential surface **84***c*. The arrangement surface **84***a* is preferably formed as a surface that extends along the longitudinal axis L and is parallel to the pivot shaft **66** of the raising portion **52**. The defining surface **84***b* is preferably a flat surface that extends along the longitudinal axis L and is orthogonal to the pivot shaft **66** of the raising portion **52**. In this case, the defining surface **84***b* is orthogonal to the arrangement surface **84***a*. The outer circumferential surface **84***c* is formed as a curved surface of a cylindrical column.

A concave portion (guide groove) **84***d* is formed in the outer circumferential surface **84***c* along the longitudinal axis

L. The concave portion **84***d* is formed at a position apart from the raising portion **52** of the raising mechanism **48** and the pulling member **54**. Preferably, the concave portion **84***d* is formed continuously from the distal end to the proximal end of the distal frame portion **72**. A guide projection portion **194** (to be described later) of the distal-end cover **14** is fit into the concave portion **84***d*. Therefore, the distal-end cover **14** is attached to the distal frame portion **72** in a predetermined state.

The second convex portion **86** includes a defining surface **86***a* that faces the defining surface **84***b* of the first convex portion **84**, a guide surface **86***b* that guides the pivotal movement of the raising base **62**, an outer circumferential surface **86***c*, and an extension surface **86***d* extending from the base portion **82**. Preferably, the defining surface **86***a* of the second convex portion **86** is a flat surface that is separated from the defining surface **84***b* of the first convex portion **84** and is parallel to the defining surface **84***b* of the first convex portion **84**. The outer circumferential surface **86***c* is formed as a curved surface of a cylindrical column. A projection **86***e* is formed on the defining surface **86***a* of the second convex portion **86** so as to come into contact with the raising base **62** when the raising base **62** is at the raised position. The projection **86***e* defines the maximum raised position at which the raising base **52** is raised most.

The raising base **62** is disposed between the defining surface **84***b* of the first convex portion **84** and the defining surface **86***a* of the second convex portion **86**, and space **85** is also formed therebetween to allow the raising base **62** to operate within a predetermined range. In the space **85**, in particular, the raising base **62** is disposed and moved within a predetermined range. A support portion **88** that supports the pivot shaft **66** of the raising base **62** is disposed on the defining surface **84***b* of the first convex portion **84** and the defining surface **86***a* of the second convex portion **86** at positions separated from the arrangement surface **84***a* of the first convex portion **84** and the extension surface **86***d* of the second convex portion **86**. The support portion **88** that supports the raising portion **52** operably is thus included in the distal frame portion **72**. In this case, the support portion **88** is formed into an almost U shape. The raising base **62** is disposed in the space **85**, and the pivot shaft **66** is disposed on the support portion **88**. The cover **14** is attached to the outside of the distal frame portion **72** and the raising portion **52**. A convex portion **198** of the inner circumferential surface **146** (to be described later) of the cover **14** prevents the pivot shaft **66** of the raising base **62** from slipping off from the support portion **88** of the distal frame portion **72**.

The guide pin **68** of the raising base **62** is placed on the guide surface **86***b* of the second convex portion **86** while the raising base **62** is disposed in the space **85** and the pivot shaft **66** is disposed on the support portion **88**. The guide surface **86***b* is formed as a proper curved surface to move the guide pin **68** between the position shown in FIGS. **2** to **3**B and the position shown in FIGS. **4**A and **4**B while supporting the guide pin **68** of the raising base **62**. The raising portion **52** thus operates on the pivot shaft **66** and the support portion **88** by the pulling force from the pulling member **54**.

The maximum width (height) W**2** of the defining surface **86***a* of the second convex portion **86** in a direction orthogonal to the longitudinal axis L is, for example, about half of the maximum width (height) W**1** of the defining surface **84***b* of the first convex portion **84** in a direction orthogonal to the longitudinal axis L. A movement space **87** which continues with the foregoing space **85** and in which the pulling member **54** and a tube (tubular elastic member) **55** covering the pulling member **54** move, is formed in a region adjacent to one side of the second convex portion **86** to which the extension surface **86***d* is directed.

The base portion **82** of the distal frame portion **72** includes the first cylindrical surface (first opening edge portion) **92** in which a first through-hole (channel hole) through which a treatment instrument extends is formed and the second cylindrical surface (second opening edge portion) **94** in which a second through-hole (a passage for the pulling member **54** of the raising mechanism **48**) inclined with respect to, for example, the longitudinal axis L is formed. The distal frame portion **72** thus includes the first opening edge portion **92** that is formed as a distal-end portion (part) of the channel **46** through which a treatment instrument (not shown) is inserted and the second opening edge portion **94** that is provided separately from the first opening edge portion **92**. The base portion **82** of the distal frame portion **72** also includes a third cylindrical surface **96** in which a third through-hole (a passage for the nozzle **45**) along, for example, the longitudinal axis L is formed. The first, second and third cylindrical surfaces **92**, **94** and **96** are each allowed to have an appropriate shape. Preferably, the first and second cylindrical surfaces **92** and **94** are, for example, cylindrical. The inner diameter of the first cylindrical surface **92** is preferably larger than that of the second cylindrical surface **94**.

The first cylindrical surface **92** extends through the distal frame portion **72** in parallel to or almost in parallel to, for example, the longitudinal axis L. More specifically, the first cylindrical surface **92** extends through the base portion **82** of the distal frame portion **72**. The first cylindrical surface **92** thus extends along, for example, the longitudinal axis L so as to make the distal end side of the base portion **82** of the distal frame portion **72** communicate with the proximal end side thereof. On the distal-end side of the first cylindrical surface **92**, the foregoing appropriate space **85** is formed in cooperation with the first and second convex portions **84** and **86** and also the cover **14**.

The second cylindrical surface (introduction hole) **94** extends through the distal frame portion **72** so as to be inclined relative to, for example, the longitudinal axis L. More specifically, the second cylindrical surface **94** extends through the base portion **82** of the distal frame portion **72**. The second cylindrical surface **94** thus makes the distal-end side of the base portion **82** of the distal frame portion **72** communicate with the proximal-end side thereof. On the distal-end side of the second cylindrical surface **94**, an appropriate space **95** is formed in cooperation with the base portion **82** and the cover **14**. The space **95** continues with the proximal-end sides of the foregoing space **85** and space **87** along the longitudinal axis L. Since the through-hole direction of the second cylindrical surface **94** is inclined relative to the longitudinal axis L, the length (the length of an elastic member **112** to be described later) between the distal end (one end) **55***a* of the tube **55** and the proximal end (the other end) **55***b* thereof can be maximized in the distal-end portion **32**, and the deformation amount of the elastic member **112** per unit volume can be reduced. Depending on the selection of a material for the elastic member **112**, the through-hole direction of the second cylindrical surface **94** preferably extends along the longitudinal axis L.

Note that the through-hole direction of the second cylindrical surface **94** coincides or almost coincides with the axial direction of the central axis (longitudinal axis) C of the pulling member **54**.

The third cylindrical surface **96** extends though the distal frame portion **72** along, for example, the longitudinal axis L. Specifically, the third cylindrical surface **96** extends through

the base portion **82** of the distal frame portion **72**. Thus, the third cylindrical surface **96** extends along, for example, the longitudinal axis L so as to make the distal-end side of the base portion **82** of the distal frame portion **72** communicate with the proximal-end side thereof. On the distal-end side of the third cylindrical surface **96**, an appropriate space **97** in which the distal end of the nozzle **45** is disposed, is formed in cooperation with the first convex portion **84** and the cover **14**.

The first cylindrical surface **92** forms the distal-end opening **92***a* of the channel **46**. The mouth ring **46***c* is fixed to the first cylindrical surface **92**. The channel tube **46***a* is fixed to the proximal-end portion of the mouth ring **46***c*.

As described above, the second cylindrical surface **94** is formed so as to be inclined relative to the longitudinal axis L. The pulling member **54** of the raising mechanism **48** extends through the second cylindrical surface **94**. The mouth ring (passage) **58***a* is fixed to the second cylindrical surface **94**. The mouth ring **58***a* forms a through hole (introduction hole) and forms a passage through which the pulling member **54** extends. That is, the distal frame portion **72** includes the mouth ring **58***a* as a passage that makes the distal-end side communicate with the proximal-end side. A tube **58***b* is fixed to the proximal-end portion of the mouth ring **58***a*. For example, an adhesive agent **58***c* is annularly applied to the proximal end of the second cylindrical surface **94** of the base portion **82** of the distal frame portion **72** and between the mouth ring **58***a* and the tube **58***b*. This prevents a fluid (a liquid, gas, etc.) from leaking from the distal end of the mouth ring **58***a* to the proximal-end side of the mouth ring **58***a* through between the outer circumferential surface of the mouth ring **58***a* and the base portion **82**.

While the proximal-end portion of the tube **55** is disposed on the second cylindrical surface **94**, an adhesive agent **98***a* and a retaining plate (protective plate) **98***b* are disposed on the mouth ring **58***a*. The adhesive agent **98***a* and retaining plate **98***b* are preferably disposed inside the insulating member **35**. Since the adhesive agent **98***a* and retaining plate **98***b* are disposed on the distal end **94***a* of the second cylindrical surface **94** of the base portion **82**, the adhesive agent **98***a* and retaining plate **98***b* maintain the proximal-end portion of the tube **55** fit into the mouth ring **58***a* and prevent it from slipping off from the mouth ring **58***a*. In addition, the adhesive agent **98***a* prevents a liquid from infiltrating from the distal-end side into the proximal-end side through between the outer circumferential surface of a mouth ring **114** (to be described later) of the tube **55** and the inner circumferential surface of the mouth ring **58***a* and between the outer circumferential surface of the mouth ring **58***a* and the second cylindrical surface **94**, that is, between the outer circumferential surface of the mouth ring **114** and the second cylindrical surface **94**.

The base portion **82** of the distal frame portion **72** includes a first wall surface **102***a*, a second wall surface **102***b* and a third wall surface **102***c* on the distal-end side of the second cylindrical surface **94**. The first wall surface (bottom surface) **102***a*, second wall surface (side surface) **102***b* and third wall surface (proximal-end surface) **102***c* are formed at positions closer to the proximal-end side than the distal-end opening **92***a* of the first cylindrical surface (channel hole) **92** along the longitudinal axis L. The first wall surface **102***a*, second wall surface **102***b* and third wall surface **102***c* form the space (gap) **95** between an opening edge **156** (to be described later) and/or the inner circumferential surface **146** of the cover **14**. In the present embodiment, the first wall surface **102***a* is formed parallel to the arrangement surface **84***a* of the first convex portion **84** and the extension surface **86***d* of the second convex portion **86**. The first wall surface **102***a* is located between the arrangement surface **84***a* of the first convex portion **84** and the extension surface **86***d* of the second convex portion **86** in a direction orthogonal to the longitudinal axis L.

The nozzle **45** extends through the third cylindrical surface **96** and is fixed thereto. The tube **45***a* is fixed to the proximal end of the nozzle **45**.

The distal end (distal-end opening) **92***a* of the first cylindrical surface **92** is formed closer to the distal-end side, along the longitudinal axis L, than the distal end **94***a* of the second cylindrical surface **94**. The distal end **92***a* of the first cylindrical surface **92** is formed on the proximal-end side of the raising base **62**. The distal end **92***a* of the first cylindrical surface **92** is formed along the longitudinal axis L so as to be closer to the distal-end side than the distal end **94***a* of the second cylindrical surface **94**. Thus, in the distal frame portion **72**, the length of the elastic member **112** (to be described later) of the tube **55** can be maximized, and the deformation amount of the elastic member **112** per unit volume can be reduced when the elastic member **112** is compressed along a central axis C.

An engaging pin **74** is fixed on the outer circumferential surface of the base portion **82** of the distal frame portion **72**. Preferably, the pin **74** is adjacent to the space **95** (first wall surface **102***a*) in the circumferential direction of the longitudinal axis L and is formed almost opposed to the concave portion (guide groove) **84***d* with the longitudinal axis L of the distal frame portion **72** therebetween.

As shown in FIG. **6**B, the raising base **62** of the raising portion **52** includes a fitting portion **62***b* in which the coupling portion **64** is fit. The fitting portion **62***b* of the raising base **62** is formed into a concave portion or a through hole in which the coupling portion **64** is disposed. In this case, the fitting portion **62***b* extends through the raising base **62** in a direction orthogonal to the longitudinal axis L.

The coupling portion **64** can rotate relative to the raising base **62** as appropriate as shown in FIGS. **3**A and **4**A, while the distal-end portion **54***a* of the pulling member **54** is fixed to a cylindrical body **64***a*.

The outer circumference of the pulling member **54** is covered with the cylindrical tube **55**. The pulling member **54** is thus disposed inside the tube **55**. The central axis of the cylindrical tube **55** coincides or almost coincides with the central axis C of the pulling member **54**. The tube **55** includes the expandable cylindrical elastic member **112** that is elastically deformed along the axial direction of the pulling member **54**, the mouth ring **114** fixed to the proximal end (the other end) of the elastic member **112**, and an O-shaped ring **116** disposed on the outer circumference of the mouth ring **114**.

In the present embodiment, the distal end (one end) **55***a* of the elastic member **112** of the tube **55** is fixed to a tubular body **64***b* of the coupling portion **64** by, for example, adhesive bonding. The inner circumferential surface of the distal end **55***a* of the elastic member **112** is entirely in tight contact with the outer circumferential surface of the tubular body **64***b* of the coupling portion **64**. This prevents a liquid and gas from infiltrating the interior of the elastic member **112** from the distal end (one end) **55***a* of the elastic member **112** of the tube **55**. That is, the one end **55***a* of the tube **55** is watertightly connected to the raising portion **52**.

As shown in FIGS. **6**A and **6**B, the other end **55***b* of the tube **55** is formed by the elastic member **112**, the mouth ring **114** and the O-shaped ring **116**. The mouth ring **114** fixes the proximal end of the elastic member **112** by, for example, clamping. The mouth ring **114** may be formed integrally or

formed from a plurality of members such as two members. The O-shaped ring **116** prevents a liquid from moving from between the outer circumferential surface of the mouth ring **114** and the inner circumferential surface of the O-shaped ring **116** along the axial direction of the mouth ring **114**.

The proximal end (the other end) **55***b* of the tube **55** is fit on the inner circumferential surface (annular circumferential surface) of the mouth ring **58***a* fixed to the distal frame portion **72**. It is preferable that the inner diameter of the mouth ring **58***a* be slightly larger than the outer diameter of the mouth ring **114** of the other end **55***b* of the tube **55** and be slightly smaller than the outer diameter of the O-shaped ring **116**. That is, the other end **55***b* of the tube **55** is watertightly connected to the distal frame portion **72** via the mouth ring **58***a*. Thus, the other end **55***b* of the tube **55** has a structure that doubly prevents a liquid from infiltrating the proximal-end side from the distal-end side through the passage (through hole) **58***a* with the adhesive agent **98***a* and the O-shaped ring **116**. Therefore, the other end (proximal end) **55***b* of the tube **55** is watertightly connected to the second opening edge portion **94** of the distal frame portion **72**.

As shown in FIG. **5**, while the proximal end (the other end) **55***b* of the tube **55** is fit to the inner circumferential surface of the mouth ring **58***a*, the adhesive agent **98***a* and the retaining plate **98***b* are disposed on the base portion **82**. This maintains the state of fitting the other end **55***b* of the tube **55** into the mouth ring **58***a* even if a force is added to release the state of fitting the other end **55***b* of the tube **55** into the mouth ring **58***a* during the use of the endoscope main body **12**. Note that the length of a portion of the elastic member **112**, which protrudes from the retaining plate **98***b* toward the distal end (the effective length of the deformable portion of the elastic member **112** excluding one end **55***a* and the other end **55***b*) is preferably, for example, about 20 mm.

The elastic member **112** of the tube **55** shown in FIGS. **6**A and **6**B is formed of a resin material that can be deformed as the pulling member **54** is pulled. The entire portion of the elastic member **112** between one end **55***a* and the other end **55***b*, in particular, is preferably deformable. The elastic member **112** includes a distal-end side region **112***a* and a proximal-end side region **112***b*. In the present embodiment, the proximal end of the distal-end side region **112***a* is continuous with the distal end of the proximal-end side region **112***b*. As described above, when the portion of the elastic member **112** which protrudes from the retaining plate **98***b* toward the distal end has a length of about 20 mm, the distal-end side region **112***a* and the proximal-end side region **112***b* each preferably have a length of, for example, about 10 mm. In addition, in the present embodiment, the elastic member **112** has a constant thickness from the distal end to the proximal end. On the other hand, the distal-end side region **112***a* and the proximal-end side region **112***b* of the elastic member **112** may be formed of different materials and each may have deformability adjusted by composition adjustment. The distal-end side region **112***a* of the elastic member **112**, which is close to the one end **55***a*, has a property of being more deformable than the proximal-end side region **112***b*, which is close to the other end **55***b*. For example, the undeformability of the proximal-end side region **112***b* is preferably higher by 10% to 30%, preferably 20%, than that of the distal-end side region **112***a*. For example, the distal-end side region **112***a* of the elastic member **112** is preferably formed of a fluorine resin or silicone resin, whereas the proximal-end side region **112***b* is preferably formed of an urethane resin. In addition, for example, the proximal-end side region **112***b* of the elastic member **112** and the boundary between the proximal-end side region **112***b* and the distal-end side region **112***a* may be formed by two-color molding (different material molding) using the above resin materials as needed. Resin materials are properly selected for the elastic member **112** so as to maintain the deformability of the distal-end side region **112***a* higher than that of the proximal-end side region **112***b* when a compression force is exerted along the central axis C.

In this manner, the elastic member **112** is formed such that the distal-end side region **112***a* located close to the one end **55***a* is more deformable upon compression along the central axis C of the tube **55** with respect to the proximal-end side region **112***b* located close to the other end **55***b*. Accordingly, when the elastic member **112** is compressed along the central axis C, the reduction ratio of the length of the distal-end side region **112***a* as compared with the length before compression is higher than that of the proximal-end side region **112***b*. That is, the side of the elastic member **112** which is connected to the raising portion **52** is more deformable than the side of the elastic member **112** which is connected to the periphery of the through hole.

The distal-end side region **112***a* of the elastic member **112** is preferably provided with a creasing tendency in advance so as to form a plurality of creases when being compressively deformed along the axial direction of the elastic member **112** as shown in FIG. **4**A. For example, when the distal-end side region **112***a* is compressively deformed along the axial direction of the elastic member **112**, a plurality of creases (a plurality of ridges and valleys) are preferably formed. Assume that when the distal-end side region **112***a* of the elastic member **112** is compressively deformed along the axial direction of the elastic member **112**, only one ridge is formed. In this case, the distal-end side region **112***a* can have a large maximum outer diameter. In contrast to this, forming a plurality of creases, that is, a plurality of ridges together with a plurality of valleys instead of only one ridge, can reduce the maximum outer diameter of the distal-end side region **112***a*. Assume that in the following description, when the distal-end side region **112***a* of the elastic member **112** is compressively deformed along the axial direction of the elastic member **112**, a plurality of creases are formed.

As shown in FIGS. **3**A and **3**B, when the elastic member **112** of the tube **55** has a natural length, the distal-end side region **112***a* can be disposed in the space **85** and the space **87**, and the proximal-end side region **112***b* can be disposed in the space **87** and the space **95**. Accordingly, the distal-end side region **112***a* of the elastic member **112** of the tube **55** is disposed between the distal-end opening **92***a* of the first cylindrical surface **92** and the raising portion **52** along the longitudinal axis L. In addition, it is preferable that only the proximal-end side region **112***b* of the elastic member **112** be disposed, without the distal-end side region **112***a*, between the distal end **94***a* of the passage **94** and the distal-end opening **92***a* of the channel hole **92**.

When the elastic member **112** of the tube **55** has a natural length, the outer circumferential surface of the elastic member **112** preferably does not come into contact with any of the first wall surface **102***a*, the second wall surface **102***b* and the distal-end face of the retaining plate **98***b* on the distal-end side of the third wall surface **102***c*. In addition, the elastic member **112** preferably does not come into any of the first convex portion **84** and the second convex portion **86**.

The outer diameter of the pulling member **54** is, for example, about 0.5 mm. The inner diameter of the elastic member **112** is, for example, about 0.8 mm, and the outer diameter of the elastic member **112** is, for example, about 1.3 mm to 1.5 mm. The clearance between the outer cir-

cumferential surface of the pulling member **54** and the inner circumferential surface of the elastic member **112** is, for example, about 0.2 mm.

The illumination window **42***a* of the illumination optical system **42**, the observation window **44***a* of the observation optical system **44**, the mouth ring **46***c* of the distal-end portion of the channel **46**, the raising portion **52** of the raising mechanism **48**, the pulling member **54**, the tube **55**, the mouth ring **58***a*, and the like are properly attached to the distal frame portion **72**. In this state, the distal-end cover **14** is attached to the outer circumferences of these components to form the distal-end portion **32**.

As shown in FIGS. **7**A to **8**A, the distal-end cover **14** includes a cover main body **142** attached to the endoscope main body **12** and a wall **144** provided on the cover main body **142**.

The cover **14** is formed of a material having electrical insulation properties. The cover **14** is preferably formed of a resin material and/or a rubber material having electrical insulation properties. In the present embodiment, the cover main body **142** of the cover **14** is formed by combining a first structure (main body) **142***a* made of a resin material and a second structure (retaining ring) **142***b* made of a rubber material. The first and second structures **142***a* and **142***b* are each formed cylindrically.

The first structure **142***a* is provided outside the distal frame portion **72** to protect the distal frame portion **72**, raising portion **52**, pulling member (elongated member) **54** and tube **55**. The first structure **142***a* has a blocking portion **152** at its distal end and an annular portion **154**, which surrounds the distal frame portion **72**, at its proximal end. The blocking portion **152** is formed like a hemispherical surface. The proximal end of the first structure **142***a*, namely, the proximal end **154***a* of the annular portion **154** is formed as a proximal-end opening.

As shown in FIGS. **7**A and **7**B, the first structure **142***a* includes an opening edge **156** and a rotating circumferential surface **158** whose cross section is shaped like a letter "C" between the blocking portion **152** and the annular portion **154**. The rotating circumferential surface **158** is formed as part of a cylinder. The rotating circumferential surface **158** defines the longitudinal axis (central axis) L of the distal-end portion **32** and the cover **14**.

As shown in FIGS. **7**A to **8**A, the opening edge **156** is opened, for example, in a direction orthogonal to the longitudinal axis L. With the opening edge **156**, the illumination window **42***a* and observation window **44***a* on the distal-end portion **32**, the nozzle **45** and the raising portion **62** are exposed outside the cover **14**.

The opening edge **156** includes a right-side edge portion **162** on the right side extending from the proximal-end side to the distal-end side along the longitudinal axis L, a U-shaped concave portion **164** continuous to the right-side edge portion **162**, a distal-end side edge portion **166** continuous to the concave portion **164**, a left-side edge portion **168** on the left side extending from the proximal side to the distal side along the longitudinal axis L, and a proximal-end side edge portion **170** between the proximal-end portions of the right-side edge portion **162** and left-side edge portion **168**. In the opening edge **156**, for example, a closed ring is formed by the right-side edge portion **162**, concave portion **164**, distal-end side edge portion **166**, left-side edge portion **168** and proximal-end side edge portion **170**. The right-side edge portion **162** and left-side edge portion **168** are preferably parallel or substantially parallel to each other. The distal-end side edge portion **166** and proximal-end side edge portion **170** are preferably parallel or substantially parallel to each other.

The right-side edge portion **162** movably covers the pulling member **54** and tube **55** of the raising mechanism **48** in cooperation with the annular portion **154** and the rotating circumferential surface **158**. Similarly, the left-side edge portion **168** covers the left side of the arrangement surface **84***a* of the first convex portion **84** of the distal frame portion **72** with respect to the illumination window **42***a* and the observation window **44***a* in cooperation with the rotating peripheral surface **158**. Note that the distal-end side edge portion **166** covers the distal-end side of the arrangement surface **84***a* of the first convex portion **84** of the distal frame portion **72** with respect to the illumination window **42***a* in cooperation with the blocking portion **152**.

At the distal end of the right-side edge portion **162**, the U-shaped concave portion **164** is formed continuously to the right-side edge portion **162**. The concave portion **164** is formed toward the distal end **152***a* of the blocking portion **152**. The portion where the concave portion **164** is formed is tapered toward the distal end along the longitudinal axis L.

The annular portion **154** includes, on its outer circumferential surface, a fitting portion **172** into which the second structure **142***b* is fit. The fitting portion **172** is circumferentially formed at a position apart from the proximal-end side edge portion **170** of the opening edge **156** toward the proximal-end side along the longitudinal axis L. The fitting portion **172** suppresses movement of the second structure **142***b* along the longitudinal axis L with respect to the first structure **142***a* and also suppresses movement thereof around the longitudinal axis L. An annular flange portion **174** is formed at the proximal end of the fitting portion **172** of the annular portion **154** so as to project outward in the radial direction of the longitudinal axis L with respect to the fitting portion **172**. On the inner periphery of the flange portion **174**, a skirt portion **174***a* is formed to become thinner toward the proximal-end side along the longitudinal axis L. The inner diameter of the skirt portion **174***a* increases toward the proximal-end side.

A slit **174***b* is formed in a position including the proximal end **154***a* of the annular portion **154** of the first structure **142***a*. Therefore, the inner diameter of the skirt portion **174***a* can be increased by elastic deformation.

The inner diameter of the inner circumferential surface **146***a* of the first structure **142***a* is preferably constant from the vicinity of the distal end of the right-side edge portion **162** of the opening edge **156** and the vicinity of the distal end of the left-side edge portion **168** thereof to the distal end of the skirt portion **174***a* of the flange portion **174**.

The second structure **142***b* includes a fitting portion **182** formed on the inner circumferential surface **146***b* and fit into the fitting portion **172** of the first structure **142***a*. The second structure **142***b* retains the outer periphery of the proximal end (proximal-end opening) **154***a* of the annular portion **154** in a state where the opening edge **156** of the first structure **142***a* is exposed. The second structure **142***b* includes an annular fitting concave portion **184** which is formed in the inner circumferential surface **146***b* and into which the flange portion **174** is fit. Therefore, as shown in FIG. **8**A, the second structure **142***b* is fit into the annular portion **154** of the first structure **142***a*. Note that the second structure **142***b* is formed on the inner circumferential surface **146***b* and includes a fitting portion **186** into which the thread wound portion **35***a* of the distal-end portion of the bending portion **34** is fit, on the proximal-end side of the fitting concave

portion **184**. A skirt portion **186***a* that becomes thinner toward the proximal-end side along the longitudinal axis L is formed on the inner periphery of the proximal end of the fitting portion **186**. The inner diameter of the skirt portion **186***a* increases toward the proximal-end side. The inner diameter of the skirt portion **186***a* can be increased by elastic deformation.

As shown in FIGS. **7**A, **7**C and **8**A, an engaging concave portion (engaging portion) **192** that can be engaged with the engaging pin **74** is formed on the inner circumferential surface **146***a* of the annular portion **154** at the proximal end of the first structure **142***a*. The engaging concave portion **192** engages the first structure **142***a* with the distal-end portion **32**. The engaging concave portion **192** may be formed in a state in which the inner circumferential surface **146***a* of the first structure **142***a* and the outer circumferential surface thereof communicate with each other, and may be simply formed concavely with respect to the inner circumferential surface **146***a* of the first structure **142***a*. The engaging concave portion **192** is preferably formed in the fitting portion **172**.

As shown in FIGS. **7**A to **8**A, a guide projection portion (second guide) **194** that is movable along the concave portion (guide groove) **84***d* of the distal frame portion **72**, is formed on the inner circumferential surface **146***a* of the first structure **142***a*. That is, the guide projection portion **194** project radially inward from the inner circumferential surface **146***a* of the first structure **142***a*. In this case, it is preferable that the guide projection portion **194** be formed from the vicinity of the distal end of the inner circumferential surface **146***a* of the first structure **142***a* to the vicinity of the proximal end thereof. Though the guide projection **194** can be formed in an appropriate shape, it has substantially a rectangular cross-section. In addition, although not shown, a plurality of guide projection portions **194** may be separated at appropriate intervals.

As shown in FIG. **7**A, a fragile portion **196** is formed between the proximal-end side edge portion **170** of the opening edge **156** of the first structure **142***a* and the proximal end **174***a* of the flange portion **174** of the annular portion **154**. At least part of the fragile portion **196** is provided in the annular portion **154** of the first structure **142***a*. The fragile portion **196** is so formed that the annular portion **154** is broken by applying stress to the annular portion **154**, and its mechanical strength is lower than that of the other part of the annular portion **154**. The fragile portion **196** includes slits (grooves) **196***a* and **196***b*. The slit **196***a* is formed continuously with the proximal-end side edge portion **170** of the opening edge **156**. The slit **196***b* is formed continuously with the proximal end **174***a* of the flange portion **174** of the annular portion **154**. The slits **196***a* and **196***b* are both formed along the longitudinal axis L. The slits **196***a* and **196***b* do not communicate with each other, but a coupling portion **196***c* is formed between them. Thus, the fitting portion **172** of the annular portion **154** is annular. Note that the engaging concave portion **192** is formed at a position separated from the coupling portion **196***c* by, e.g. about 90° in the circumferential direction with respect to the longitudinal axis L. The guide projection portion **194** is formed at a position separated from the coupling portion **196***c* by, e.g. about 90° in the circumferential direction on the side opposite to the engaging concave portion **192** with respect to the longitudinal axis L. The fragile portions **196** are preferably located at a position separated from the guide projection portion **194** and the engaging concave portion **192** by about 90° in the circumferential direction with respect to the central axis C. That is, the guide projection portion **194** differs from the engaging concave portion **192** in the position in the circumferential direction with the longitudinal axis L and is separated therefrom. As will be described later, it is also preferable that the fragile portion **196** is separated from the guide projection portion **194** over 90°, and the distance between the fragile portion **196** and the engaging recess **192** is shorter than the distance between the guide projection portion **194** and the fragile portion **196**.

Since the slits **196***a* and **196***b* are formed in the fragile portion **196**, a thick portion constituting the annular portion **154** is secured only in the portion of the coupling portion **196***c*. If, therefore, an external stress is applied to the annular portion **154**, the stress is concentrated on the coupling portion **196***c*, and the coupling portion **196***c* is mechanically broken more easily than the other portion of the annular portion **154**. That is, the mechanical strength of the fragile portion **196** is lower than that of the other part of the annular portion **154** as the entire fragile portion including the slits **196***a* and **196***b* and the coupling portion **196***c*.

Instead of the slits (grooves) **196***a* and **196***b*, perforations may be formed in the cover main body **142** of the cover **14**.

As described above, the fragile portion **196** is formed as a region to be broken when the cover **14** is removed from the distal-end side of the insertion portion **22** of the endoscope main body **12**. When the fragile portion **196** is not broken or the fragile portion **196** is not formed, the annular state of the annular portion **154** is maintained without plastic deformation of the cover main body **142** of the cover **14**. It is thus difficult to remove the cover **14** from the distal-end side of the insertion portion **22** of the endoscope main body **12**.

In the present embodiment, it is preferable that the fragile portion **196** be formed so as to be disposed on the space **95** in which the pulling member **54** moves, not on the arrangement surface **84***a* of the first convex portion **84** of the distal frame portion **72**. The slit **196***b* on the proximal-end side contributes to elastic deformation of the annular portion **154**. That is, when the engaging concave portion **192** is engaged with the engaging pin **74**, the flange portion **174** is elastically deformed.

As shown in FIGS. **7**A to **8**A, a convex portion **198** projecting toward the opening edge **156** is formed at a position opposed to the opening edge **156** on the inner circumferential surface **146** of the cover **14**. The convex portion **198** is thicker than the other part of the inner circumferential surface **146** and is formed to have an appropriate length in parallel to the longitudinal axis L. The convex portion **198** can press the pivot shaft **66** of the raising base **62** toward the support portion **88** of the distal frame portion **72**. Note that it is preferable that the proximal end of the convex portion **198** have no step or be small and be smoothly continuous with the inner circumferential surface **146***a* of the cover **14**. Therefore, when the cover **14** is to be attached to the distal frame portion **72**, the convex portion **198** can be prevented from being hooked on the distal end or the like of the second convex portion **86**.

The wall **144** is provided at the opening edge **156**, for example. In the present embodiment, the wall **144** is integrated with the right-side edge portion **162** of the first structure **142***a* of the cover main body **142**. The wall **144** extends from the opening edge **156** toward the inner circumferential surface **146***a* of the first structure **142***a* opposed to the opening edge **156**. The wall **144** is disposed between the raising base **62** and the tube **55**. The wall **144** has only to be able to prevent interference between the raising base **62** and the tube **55**. Thus, the wall **144** need not be formed from the proximal end to the distal end in the right-side edge

portion **162**. The wall **144** is preferably disposed in the space **85** and space **87** of the distal frame portion **72**.

Note that the shape or material of the wall **144** and tube **55** is suitably selected such that friction between the wall **144** and the tube **55** can be minimized when the tube **55** comes into contact with the wall **144**.

The operation of the endoscope **10** according to this embodiment will be described next.

As shown in FIGS. **8**A and **8**B, the cover **14** preferably includes a combination of the first and second structures **142***a* and **142***b*. Then, the distal-end cover **14** is attached to the distal-end portion **32** of the insertion portion **22** of the endoscope main body **12** by defining the circumferential direction of the longitudinal axis L from the states shown in FIGS. **8**A and **8**B to the states shown in FIGS. **9**A to **9**C. At this time, as shown in FIGS. **8**B and **9**B, the guide projection portion **194** of the cover **14** is fit into the concave portion (guide groove) **84***d* of the distal frame portion **72** and moved along the longitudinal axis L. The cover **14** is thus prevented from being shifted in position from the distal frame portion **72** in the circumferential direction.

When the cover **14** is attached to the distal-end portion **32**, the skirt portion **186***a* of the fitting portion **186** of the second structure **142***b* of the cover **14** and the skirt portion **174***a* of the annular portion **154** of the first structure **142***a* thereof are sequentially brought into contact with the engaging pin **74** of the distal-end frame portion **72** shown in FIG. **8**A. Then, the annular portion **154** is elastically deformed by the slit **196***b*. The engaging concave portion **192** is thus engaged with the engaging pin **74**. Then, the cover **14** is prevented from being shifted in position from the distal-end portion **32** in the axial and circumferential directions.

Note that the proximal-end side edge portion **144***b* of the wall **144** can be brought into contact with the distal end **82***a* of the base portion **82** of the distal frame portion **72** when the distal-end cover **14** is attached to the distal-end portion **32** of the endoscope main body **12**. The proximal-end side edge portion **144***b* of the wall **144** can thus be used for axial positioning of the distal-end cover **14** with respect to the distal frame portion **72**.

As the cover **14** is attached to the distal-end portion **32** while it is prevented from being shifted in position, the convex portion **198** of the inner circumferential surface **146***a* of the cover **14** shown in FIG. **8**A presses the pivot shaft **66** of the raising portion **52** toward the support portion **88** of the distal frame portion **72**. The convex portion **198** protrudes from the inner circumferential surface **146***a* toward the opening edge **156**. The convex portion **198** is thicker than, for example, other portions adjacent to the convex portion **198**. Even though the other portions adjacent to the convex portion **198** are thus thinner as shown in FIGS. **10**A to **10**C, the first structure **142***a* of the cover **14** prevents the pivot shaft **66** of the raising portion **52** from coming off from the support portion **88** of the distal frame portion **72** against an external force including the gravity of the raising portion **52**. Thus, the pivot shaft **66** of the raising portion **52** is rotatably supported by the support portion **88** of the distal frame portion **72**, and this support state is maintained. That is, when the cover **14** is attached to the outside of the distal frame portion **72** of the distal-end portion **32**, the pivot shaft **66** of the raising portion **52** is positioned on the inner circumferential surface of the distal-end cover **14** relative to the distal-end frame portion **72** as the wall **144** is provided between the tube **55** and the raising base **62**.

The convex portion **198** is formed to have an appropriate length along the longitudinal axis L. The support portion **88** is brought into contact with the convex portion **198**. Thus, contaminants and the like are prevented as much as possible from entering between the convex portion **198** of the cover **14**, the pivot shaft **66** of the raising portion **52** and the support portion **88** of the distal frame portion **72**.

When the cover **14** is attached to the distal-end portion **32** of the endoscope main body **12** while it is prevented from being shifted in position as shown in FIGS. **9**A to **10**D, the wall **144** is inserted in the space **85** and the space **72** in sequence from the distal-end side of the distal frame portion **72**. The raising base **62** is located in a lowered position, and the cover **14** is prevented from being shifted in position in the circumferential direction. The wall **144** is thus prevented from coming into contact with the raising base **62** and the tube **55**. That is, the wall **144** is prevented from interfering with the raising base **62** and the tube **55**. The wall **144** is disposed between the raising base **62** and the tube **55**.

The cover **14** covers the outer circumferential surface of the base portion **82** of the distal frame portion **72** and also covers the outer circumferential surface **84***c* of the first convex portion **84** and the outer circumferential surface **86***c* of the second convex portion **86**. The opening edge **156** of the cover **14** exposes the illumination window **42***a* of the illumination optical system **42** and the observation window **44***a* of the observation optical system **44** toward the outside of the endoscope **10**. The opening edge **156** of the cover **14** also exposes the space **85** in which the raising base **62** is disposed, toward the outside of the endoscope **10**. The inner circumferential surface **146***a* and the distal frame portion **72** of the cover **14** define the space **85**, space **87** and space **95**, and cooperate with the inner circumferential surface **146** of the cover **14** to define a movable region of the pulling member **54** and the elastic member **112**.

At this time, as shown in FIGS. **9**C and **10**D, the illumination window **42***a*, observation window **44***a* and nozzle **45** are exposed to the opening edge **156** of the cover **14**, and the raising base **62** is exposed such that it can be swung in an appropriate range. When a treatment instrument (not shown) is guided by the raising base **62** and protrudes from the distal end of the raising base **62**, it can be prevented from interfering with the cover **14** by the concave portion **164** of the opening edge **156**. Note that a gap is formed between the raising base **62** and the cover **14**. Even though the raising base **62** is swung, the amount of gap between the raising base **62** and the cover **14** varies, but the gap is maintained. Thus, a hinderance of the cover **14** to the movement of the raising base **62** is prevented.

When the lever **56** supported by the operation portion **24** shown in FIG. **1** is operated, the raising portion **52** supported by the distal frame portion **72** is moved in conjunction with the pulling member **54**. When the lever **56** is pushed up the most (first position), the raising portion **52** is disposed at the lowered position shown in FIG. **10**A. Then, the pulling force on the pulling member **54** is released, and the pulling member **54** is moved to the most distal-end side. As the lever **56** is pushed down, the pulling member **54** is pulled toward the proximal-end side, and the raising portion **52** is rotated about the pivot shaft **66** supported by the support portion **88** of the distal frame portion **72**. The raising portion **52** is thus placed at the raised position shown in FIG. **10**B while the lever **56** is pushed down the most (second position).

Incidentally, when the lever **46** is in the first position, it is prevented from moving unintentionally from the first position to the second position by the elastic force of the pulling member **44**, the tube **45** and the like, with the result that the operation portion **42** is prevented from swinging unintentionally.

The lever **56** shown in FIG. **1** is placed in the first position, and the raising portion **52** is placed in the lowered position shown in FIG. **10**A. The elastic member **112** of the tube **55** outside the pulling member **54** has a natural length. No creases are caused in the elastic member **112** of the tube **55**. Alternatively, the creases in the elastic member **112** of the tube **55** are lengthened the most.

The lever **56** shown in FIG. **1** is disposed in the second position, and the raising portion **52** is disposed in the raised position shown in FIG. **10**B. Though one end **55***a* of the tube **55** is movable relative to the distal frame portion **72**, the other end **55***b* is fit to the distal frame portion **72** and thus it cannot be moved. For this reason, when the pulling member **54** is pulled by the operation of the lever **56** to move the raising portion **52** from the lowered position to the raised position, the one end **55***a* of the tube **55** moves toward the other end **55***b*. A compressive force is then applied to the elastic member **112** of the tube **55** to shrink from its natural length along the central axis C of the elastic member **112**. Thus, when the raising portion **52** is in the raised position, creases are formed in the elastic member **112** of the tube **55**.

The elastic member **112** is formed such that the distal-end portion **112***a* is more easily deformed to be compressed in a direction along the central axis C of the elastic member **112** (length direction) than the proximal-end side portion **112***b*. Thus, the distal-end side portion **112***a* of the elastic member **112** is greatly deformed, and the proximal-end side portion **112***b* thereof is deformed less than the distal-end side portion **112***a*. When a compressive force by which the elastic member **112** is shrunk from the natural length is applied to the elastic member **112**, the proximal-end side portion **112***b* is deformed into, e.g. a wave shape from the straight state shown in FIG. **10**A to a state in which the inner and outer diameters of the elastic member **112** are substantially maintained as shown in FIG. **10**B. The proximal-end side portion **112***b* is deformed into a wave shape and is not deformed to cause creases. A plurality of creases are formed in the distal-end side portion **112***a* from the state shown in FIG. **10**A without maintaining the inner and outer diameters of the elastic member **112** as shown in FIG. **10**B. In the elastic member **112** of the tube **55**, therefore, the distal-end side portion **112***a* is more easily deformed to cause continuous compressed creases along the central axis C of the pulling member **54** and the elastic member **112** of the tube **55** than the proximal-end side portion **112***b*. That is, in the elastic member **112** of the tube **55**, the distal-end side portion **112***s*, which is a portion disposed between the distal-end opening **92***a* of the first cylindrical surface **92** and the raising portion **52**, is more easily deformed to cause continuous compressed creases along the central axis C of the tube **94** than the proximal-end side portion **112***b* that is a portion disposed between the distal end **94***a* of the passage **94** and the distal-end opening **92***a* of the channel hole **92**. Therefore, the creases caused in the elastic member **112** are formed chiefly in the distal-end side portion **112***a* and are prevented from being formed in the proximal-end side portion **112***b*.

As shown in FIG. **10**B, the creases are formed chiefly in the space **87** (see FIG. **4**B). The wall **144** is disposed between the raising base **62** and the tube **55** at a position including the space **87**. The wall **144** may be in contact with the distal-end side portion **112***a* of the elastic member **112** of the creased tube **55** on the opposite surface of the side facing the raising base **62**. Even in this case, the wall **144** prevents the distal-end side portion **112***a* of the creased tube **55** from coming into contact with the raising base **62**. Therefore, the wall **144** prevents the tube **55** from interfering with the raising base **62**.

When the endoscope **10** is in use, the guide path **62***a* of the raising base **62** guides the treatment instrument by operation between the lowered position (see FIGS. **10**A, **3**A and **3**B) and the raised position (see FIGS. **10**B, **4**A and **4**B), and changes the direction of the distal end of the treatment instrument to a direction away from the direction along the longitudinal axis L of the insertion portion **22**. At this time, the treatment instrument receives not only a reaction force from the guide path **62***a* but also an external force such as gravity. For this reason, the treatment instrument is likely to come off from the guide path **62***a* of the raising base **62**. Even in this case, the wall **144** prevents the treatment instrument from coming into contact with the tube **55**. Therefore, the life of the tube **55** can be made longer than when the tube **55** is in contact with the raising base **62** and/or the treatment instrument.

When the tube **55** is moved with the outer circumferential surface of the elastic member **112** of the tube **55** in contact with the wall **144** of the cover **14**, friction occurs between the outer circumferential surface of the elastic member **112** of the tube **55** and the wall **144** of the cover **14**. A space between the outer circumferential surface of the elastic member **112** of the tube **55** and the wall **144** of the cover **14** is formed in a shape that minimizes the friction, and a material is selected. Thus, friction generated between the outer circumferential surface of the elastic member **112** of the tube **55** and the wall **144** of the cover **14** is minimized.

When a plurality of creases are formed in the distal-end side portion **112***a* of the elastic member **112** of the tube **55**, the outer circumferential surface of the pulling member **54** easily comes into contact with the inner circumferential surface of the distal-end side portion **112***a* of the elastic member **112**. However, the moving amount of the pulling member **54** relative to the elastic member **112** of the tube **55** is smaller toward the distal end (one end **55***a* of the tube **55**) of the elastic member **112**. Therefore, friction generated between the outer circumferential surface of the pulling member **54** and the inner circumferential surface of the distal-end side portion **112***a* of the elastic member **112** is minimized.

As described above, the proximal-end side portion **112***b* of the elastic member **112** of the tube **55** is disposed along the longitudinal axis L between the distal end **94***a* of the passage **94** and the distal-end opening **92***a* of the first cylindrical surface (channel hole) **92**. That is, the proximal-end side portion **112***b* of the elastic member **112** of the tube **55** allows the proximal-end side portion **112***b* to be deformed and is disposed in an appropriate space **95** formed between the proximal-end side portion **112***b* and the inner circumferential surface **146** of the distal-end cover **14**. The proximal-end side portion **112***b* of the elastic member **112** of the tube **55** is prevented from being deformed so as to be compressed in its length direction. Thus, the proximal-end side portion **112***b* of the elastic member **112** of the tube **55** is deformed into, e.g. a wave shape. The proximal-end side portion **112***b* is prevented from coming into contact with the first wall surface **102***a*, second wall surface **102***b* and inner circumferential surface **146** of the distal-end cover **14**. Therefore, the deformation of the proximal-end side portion **112***b* of the elastic member **112** is suppressed within the range of the space **95**. Since the deformation of the proximal-end side portion **112***b* of the elastic member **112** of the tube **55** is suppressed, the proximal-end side portion **112***b* is prevented from coming into contact with the inner circumferential surface **146** of the distal-end cover **14** even though it is deformed.

Furthermore, the amount of movement of the pulling member **54** to the raising portion **52** increases from the one end **55***a* toward the other end **55***b*, and a clearance between the inner circumferential surface of the proximal-end side portion **112***b* and the pulling member **54** is maintained as appropriate. Therefore, friction generated between the outer circumferential surface of the pulling member **54** and the inner circumferential surface of the proximal-end side portion **112***b* of the elastic member **112** is minimized.

In the sheet of FIG. **10**B, the extension surface **86***d* of the second convex portion **86** that forms the space **87** is located lower than the position of the first wall surface **102***a* on the distal-end side of the second cylindrical surface **94** that forms the space **95**. In the sheet of FIG. **4**B, the defining surface **84***b* of the first convex portion **84** that forms the space **87** is located on the right side more than the position of the second wall surface **102***b* on the distal-end side of the second cylindrical surface **94** that forms the space **95**. The space **87** is formed larger in the vertical and width directions than the space **95**. As shown in FIG. **10** (FIG. **4**B), the length La of the part of the distal-end side portion **112***a* of the elastic member **112** of the tube **55** where creases are formed, in the direction along the central axis (longitudinal axis) C of the elastic member **112**, is shorter than the length Lb of the part where the proximal-end side portion **112***b* is deformed in the direction along the central axis (longitudinal axis) C of the elastic member **112**. The elastic member **112** of the tube **55** is thus kept in the range of the space **86** even though the distal-end side portion **112***a* expands in the vertical and width directions when creases are formed. Even though the distal-end side portion **112***a* of the elastic member **112** of the tube **55** is deformed to form a plurality of creases, the deformed distal-end side portion **112***a* is prevented from coming into contact with the first convex portion **84** and second convex portion **86** of the distal frame portion **72** and the inner circumferential surface **146** of the distal-end cover **14**.

Unlike in the example shown in FIG. **10**B, as shown in FIG. **11**, the tube **55** can be formed such that the space between the distal-end side portion **112***a* and the proximal-end side portion **112***b* is deformed into substantially a uniform wave shape when a compressive force is applied along the central axis C by material adjustment and the like. In this case, the maximum outer diameter of the tube **55** when it is deformed can be made smaller than that when creases are formed in the distal-end side portion **112***a* of the tube **55**. Thus, even though the tube **55** is entirely deformed into a wave shape when the raising portion **52** is disposed in the raised position, the wall **144** prevents the tube **55** from interfering with the raising base **62**.

When the pulling of the pulling member **54** is released by the lever **56** to move the raising portion **52** from the raised position to the lowered position, the one end **55***a* of the tube **55** moves in a direction away from the other end **55***b* along the central axis C of the elastic member **112**. Then, the compressive force (shrinkage) of the tube **55** with respect to the elastic member **112** is gradually released and returned to the natural length.

After the endoscope **10** is used, the distal-end cover **14** is removed from the distal-end portion **32** of the endoscope main body **12**. In this case, the right-side edge portion **162** of the opening edge **156** of the distal-end cover **14** is pressed against the distal-end portion **32** of the endoscope main body **12** so as to increase the distance from the left-side edge portion **168** to the longitudinal axis L and the central axis C. Since the projection portion **194** of the cover **14** is fit into the concave portion (guide groove) **84***d* of the distal frame portion **72**, the cover **14** is prevented from moving about the longitudinal axis L with respect to the distal-end portion **32**. Therefore, when a load is applied to the cover **14**, the coupling portion **196***c* of the fragile portion **196** separated from the projection portion **194** is broken. In addition, as the coupling portion **196***c* is broken, the engagement between the engaging concave portion **192** of the cover **14** and the engaging pin **74** of the distal-end portion **32** is disengaged.

As the coupling portion **196***c* is broken, the wall **144** is likely to apply a load to separate the tube **55** and the pulling member **54** from the defining surface (plane) **84***b* of the first convex portion **84** of the distal frame portion **72**. The wall **144** is formed of a thin resin material that is integrated with the first structure **142***a* as one component. The wall **144** is thus prevented from applying a load to damage the tube **55** and/or the pulling member **54**.

Then, the distal-end cover **14** is moved toward the distal end along the longitudinal axis L with respect to the distal-end portion **32** to release the fitting of the projection portion **194** of the cover **14** into the concave portion (guide groove) **84***d* of the distal frame portion **72** and remove the cover **14** from the distal-end portion **32**.

Incidentally, as the cover **14** is removed from outside the distal frame portion **72** of the distal-end portion **32** and the wall **144** is moved out from between the tube **55** and the raising portion **52**, the support of the pivot shaft **66** of the raising portion **52** on the convex portion **198** of the inner circumferential surface **146** of the cover **14** is released. Thus, the positioning of the pivot shaft **66** of the raising portion **52** with respect to the distal frame portion **72** is released.

The removed cover **14** is discarded. The endoscope main body **12** is cleaned. The distal-end portion **32** of the endoscope main body **12** is cleaned as appropriate using a brush or the like. At this time, the fitting of the pivot shaft **66** of the raising portion **52** into the support portion **88** of the distal frame portion **72** can be released. Thus, the support portion **88** on which the raising portion **52** is supported is also easily cleaned. Then, the endoscope main body **12** is disinfected and sterilized for reuse.

As described above, the following can be said about the endoscope **10** according to the present embodiment.

The wall **144** is provided between the tube **55** inside which the pulling member **54** is disposed and the raising portion **52**. The wall **144** is formed in the distal-end cover **14** of the endoscope **10**. According to the present embodiment, therefore, there can be provided the distal-end cover **14** for the endoscope **10**, which can prevent the tube **55** outside the pulling member **54** from coming into contact with the raising portion **52**, and the endoscope **10**, even though the raising portion **52** is operated in accordance with the movement of the pulling member **54**. According to the present embodiment, there can also be provided the distal-end cover **14** for the endoscope **10**, which can prevent the tube **55** outside the pulling member **54** from coming into contact with the raising portion **52** and the treatment instrument, and the endoscope **10**, even though the treatment instrument is moved in accordance with the operation of the raising portion **52**.

When the endoscope **10** is used, the wall **144** is provided between the raising base **62** and the tube **55**. The wall **144** can thus prevent contaminants and the like from entering the tube **55** from the raising base **62** through the opening edge **156** of the cover **14**. On the other hand, when the cover **14** is removed from the distal-end portion **32**, the wall **144** is removed from the distal-end portion **32**. Thus, the raising portion **52** of the raising mechanism **48** of the distal-end portion **32** and its vicinity can easily be cleaned. Therefore,

the wall **144** provided in the main body **142** of the cover **14** can be prevented from affecting the cleanability of the distal-end portion **32** of the endoscope main body **12** using a brush or the like.

It is preferable that the distal-end side portion **112***a* of the tube **55** be more easily deformed than the proximal-end side portion **112***b* thereof. Since the wall **144** is disposed between the distal-end side portion **112***a* of the tube **55** and the raising base **62** when the raising portion **52** is raised, it can prevent the deformed distal-end side portion **55***a* of the tube **55** from coming into contact with the raising base **62**.

When the raising base **62** is moved to the raised position and brought into contact with the projection **86***e* formed on the defining surface **86***a* of the second convex portion **86**, a distal-end side edge portion **144***a* of the wall **144** according to the present embodiment may be brought close to or brought into contact with the raising base **62**. At this time, distal-end side edge portion **144***a* of the wall **144** can define the maximum position at which the raising base **62** is raised.

## First Modification

A first modification to the distal-end cover **14** will be described below with reference to FIG. **12**.

As shown in FIG. **12**, a fragile portion **202** is formed between the right-side edge portion **162** and the wall **144**. As described above, when the cover **14** is removed from the distal-end portion **32** of the insertion portion **22** of the endoscope main body **12**, the wall **144** presses the tube **55** and the pulling member **54** in a direction away from the raising base **62**. In this case, a load is likely to be applied to the tube **55** and the pulling member **54**. When the first structure **142***a* of the distal-end cover **14** is removed from the endoscope main body **12** by the fragile portion **202**, the wall **144** is bent by the pressure from the tube **55** (and the pulling member (elongated member) **54** disposed inside the tube **55**). Thus, when the wall **144** receives reaction force from the tube **55** (and the pulling member **54**), it is deformed or broken such that the fragile portion **202** suppresses the load applied by the wall **144**. Therefore, when the cover **14** is removed from the distal-end portion **32** of the insertion portion **22** of the endoscope main body **12**, the wall **144** can be prevented as much as possible from applying a load to the tube **55** and the pulling member **54**.

## Second Modification

A second modification to the distal-end cover **14** will be described below with reference to FIG. **13**.

As shown in FIG. **13**, the wall **144** is fixed to the right-side edge portion **162** of the opening edge **156** with a rubber material that is separate from the first structure **142***a*. As described above, when the cover **14** is removed from the distal-end portion **32** of the insertion portion **22** of the endoscope main body **12**, the wall **144** presses the tube **55** and the pulling member **54** in a direction away from the raising base **62**. In this case, a load is likely to be applied to the tube **55** and the pulling member **54**. If, however, the wall **144** receives reaction force from the tube **55** and the pulling member **54**, the wall **144**, which is made of a rubber material, is deformed to suppress the load applied by the wall **144**. Therefore, when the cover **14** is removed from the distal-end portion **32** of the insertion portion **22** of the endoscope main body **12**, the wall **144** can prevent a load from being applied to the tube **55** and the pulling member **54** as much as possible. That is, the wall **144** made of a rubber material according to the present modification is used as a portion to be deformed by the tube **55** and the pulling member **54** when the first structure (cover main body) **142***a* is removed from outside the distal frame portion **72**.

## Third Modification

A third modification to the distal-end cover **14** will be described below with reference to FIG. **14**.

As shown in FIG. **14**, the wall **144** is integrated with the second structure **142***b* as one component by means of an arm **204**. That is, the wall **144** is formed at the distal end of the second structure **142***b*. It is preferable that the wall **144** be in contact with the right-side edge portion **162** of the opening edge **156** of the first structure **142***a*. As described above, when the cover **14** is removed from the distal-end portion **32** of the insertion portion **22** of the endoscope main body **12**, the wall **144** presses the tube **55** and the pulling member **54** in a direction away from the raising base **62**. In this case, a load is likely to be applied to the tube **55** and the pulling member **54**. If, however, the wall **144** receives reaction force from the tube **55** and the pulling member **54**, the wall **144**, which is made of a rubber material, is deformed to suppress the load applied by the wall **144**. Therefore, when the cover **14** is removed from the distal-end portion **32** of the insertion portion **22** of the endoscope main body **12**, the wall **144** can prevent a load from being applied to the tube **55** and the pulling member **54** as much as possible. That is, the wall **144** made of a rubber material according to the present modification is used as a portion to be deformed by the tube **55** and the pulling member **54** when the first structure (cover main body) **142***a* is removed from outside the distal frame portion **72**.

## Fourth Modification

A fourth modification to the distal-end cover **14** will be described below with reference to FIG. **15**.

In the distal-end cover **14** shown in FIG. **15**, the wall **144** is integrated with not the right-side edge portion **162** but the proximal-end side edge portion **170** of the opening edge **156** of the first structure **142***a*. The wall **144** extends from a position closer to the left-side edge portion **168** than the fragile portion **196** in particular. The wall **144** is provided between the tube **55** and the raising base **62** by the arm **206** in the same manner as described in the foregoing first embodiment. The wall **144** is formed to continuous with the fragile portion **196**.

As described above, when the cover **14** is removed from the distal-end portion **32** of the insertion portion **22**, the right-side edge portion **162** of the opening edge **156** is separated from the left-side edge portion **168** to break the fragile portion **196**. At this time, the arm **206** is located closer to the left-side edge portion **168** than the fragile portion **196** in the proximal-end side edge portion **170**. Thus, when the fragile portion **196** is broken, the wall **144** is prevented from moving together. That is, the wall **144** can prevent a load from being applied to the tube **55** and the pulling member **54**.

Therefore, the position of the wall **144** is not limited to the right-side edge portion **162** of the opening edge **156** of the first structure **142***a*, but may be other portions such as the proximal-end side edge portion **170**.

## Fifth Modification

A fifth modification to the distal-end cover **14** will be described below with reference to FIGS. **16**A and **16**B.

The distal-end cover **14** shown in FIGS. **16**A and **16**B is an example in which the first and second structures **142***a* and **142***b* are integrated as one component. In other words, the cover **14** need not necessarily be configured by combining a plurality of members. As described above, the cover **14** may be formed of one member or a plurality of members such as two members.

Note that FIG. **16**A shows an example in which the slit **196***b* is replaced with a thin portion that is thinner than its adjacent portion. Thus, the fragile portion (a region to be broken) **196** is formed in various states, such as a slit, perforations and a thin portion in such a manner that it is prevented from being broken during the use of the endoscope **10** and it is broken easily after the use, or immediately before cleaning, disinfection, sterilization, etc.

## Sixth Modification

A sixth modification to the distal-end cover **14** will be described below with reference to FIG. **17**.

In the distal-end cover **14** shown in FIG. **17**, the wall **144** differs from the above-described example in its shape. The distal end of the wall **144** is located close to the coupling portion **64** of the raising portion **52** in the lowered position. That is, it is also preferable that the wall **144** be disposed not only in the space **87** but also in the space **85** to prevent interference between the tube **55** and the raising base **62**, provided that the wall **144** does not interfere with the raising portion **52**.

As described above, the wall **144** is set appropriately as long as its shape does not interfere with the operation of the coupling portion **64** of the raising portion **52**. For example, the wall **144** can be configured such that its edge portion **144***c* extends from the opening edge **156** of the cover **14** toward the extension surface **86***d* of the second convex portion **86** and is in contact with or close to the extension surface **86***d*. The wall **144** may be formed at a position where a treatment instrument tends to protrude from the guide path **62***a* of the raising base **62**. Therefore, the size and shape of the wall **144** are set appropriately.

## Seventh Modification

A seventh modification to the distal-end cover **14** will be described below with reference to FIG. **18**.

In the distal-end cover **14** shown in FIG. **18**, the shape of the wall **144** differs from the example described above. The wall **144** is not planar. The proximal end **144***b* of the wall **144** is located close to the distal end **82***a* of the base portion **82** and above the proximal-end side portion of the raising base **62**. As shown in FIG. **18**, a portion of the wall **144**, which is closer to its proximal-end side than a displacement portion **208**, is disposed on the space **85** (see FIGS. **3**A to **4**B) in which the raising base **62** is disposed. Instead of the displacement portion **208** of the wall **144**, the distal-end side of the wall **144** formed as a curved surface may be disposed on the space **85** in which the raising base **62** is disposed. It is thus possible to avoid as much as possible the contact between the portion of the wall **144** closer to the proximal-end side than the displacement portion **208** and the distal-end side portion **112***a* of the tube **55** where creases are formed by raising the raising base **62**.

In the foregoing first embodiment including the modifications, an example in which the distal end **55***a* of the tube **55** is connected to the raising portion **52** has been described. As shown in FIG. **19**, it is also preferable that the distal end **55***a* of the tube **55** is connected to the pulling member **54** watertightly by an adhesive or the like indicated by reference symbol **55***c*. Thus, at least part of the pulling member **54** may be exposed to the outside.

## Second Embodiment

A second embodiment will be described with reference to FIGS. **20**A to **21**B. This embodiment is a modification of the first embodiment including the above modifications. The same reference numerals denote the same members or members having the same functions as those described in the first embodiment when possible, and a detailed description of the members will be omitted.

In the present embodiment, as shown in FIGS. **20**A to **21**B, a wall **244** is formed in the distal frame portion **72** of the endoscope main body **12**. The wall **244** is preferably formed integrally with the distal frame portion **72** as one component by the same material (e.g. stainless steel), but may be formed of another member and fixed to the distal frame portion **72**. For this reason, the distal-end cover **214** of the endoscope **10** according to the present embodiment need not be provided with the wall **144** (see FIGS. **7**B and **10**C) as shown in FIG. **20**B. The distal-end cover **214** corresponds to the distal-end cover **14** shown in, for example, FIGS. **7**B and **10** C and excluding the wall **144**.

The wall **244** is provided on the distal frame portion **72** closer to the distal-end side along the longitudinal axis L than the distal-end opening **92***a* of the first cylindrical surface (first opening edge portion) **92**. The wall **244** is formed on, for example, the extension surface **86***d* of the second convex portion **86** of the distal frame portion **72**. The wall **244** extends from the extension surface **86***d* of the second convex portion **86** toward the space **87**. Thus, the wall **244** extends toward the opening edge portion **156** of the cover **214**.

Like the wall **144** of the distal-end cover **14** described in the first embodiment, the wall **244** is provided between the tube **55** and the raising portion **52**. As shown in FIG. **21**B, the distal end of the wall **244** along the longitudinal axis L is located in a position where it does not contact the coupling portion **64** of the raising portion **52**, when the raising base **62** is placed in the raised position.

As shown in FIGS. **20**A to **21**B, the side of the wall **244** facing the raising base **62** is preferably formed as a plane parallel to the defining surface (plane) **84***b* that defines the moving direction of the raising base **62**. The side of the wall **244** facing the tube **55** and the pulling member **54** preferably has a surface parallel to the defining surface **84***b*. The side of the wall **244** facing the tube **55** and the pulling member **54** may be convex to project toward the tube **55** and the pulling member **54** and may be concave to allow deformation of the tube **55** and the pulling member **54**. It is preferable that a surface of the wall **244** that is in contact with or close to the tube **55** is formed by, for example, fluorine coating so as to improve slidability with respect to the tube **55**.

The following can be said about the endoscope **10** according to the present embodiment.

The wall **244** is formed in the distal frame portion **72** of the endoscope **10** between the raising portion **52** and the tube **55** inside which the pulling member **54** is disposed. According to the present embodiment, therefore, even though the raising portion **52** is operated in accordance with the movement of the pulling member **54**, it is possible to provide the endoscope **10** capable of preventing the tube **55** outside the pulling member **54** from coming into contact with the raising portion **52**. According to the present embodiment,

furthermore, even though a treatment instrument is moved along with the operation of the raising portion **52**, it is possible to provide the endoscope **10** and the distal-end cover **2** for the endoscope **10** capable of preventing the tube **55** outside the pulling member **54** from coming into contact with the raising portion **52** and the treatment instrument.

The tube **55** in FIG. **21**B is formed into a wave shape when it is compressed along the central axis C, unlike the tubes shown in FIGS. **10**B, **4**A and **4**B when the raising base **62** is located in the raised position. In this case, the deformation amount is smaller than that using the elastic member **112** described in the first embodiment as the tube **55**. Since the wall **244** is disposed between the tube **55** and the raising base **62** when the raising portion **52** is raised, the deformed portion of the tube **55** can be prevented from coming into contact with the raising base **62**.

As the tube **55**, the elastic member **112** described in the first embodiment may be used. Since, in this case, the wall **244** is disposed between the raising base **62** and the distal-end side portion **112***a* of the tube **55** when the raising portion **52** is raised, the deformed distal-end side portion **112***a* of the tube **55** can be prevented from coming into contact with the raising base **62**.

## First Modification

A first modification to the endoscope **10** will be described below with reference to FIG. **22**.

The shape of the wall **244** provided in the distal frame portion **72** shown in FIG. **22** differs from the example described above. The wall **244** is not planar. The proximal end **244***b* of the wall **244** is located close to the distal end **82***a* of the base portion **82** and above the proximal-end side portion of the raising base **62**. As shown in FIG. **22**, a portion of the wall **244**, which is closer to its proximal-end side than the displacement portion **208**, is disposed on the space **85** (see FIGS. **3**A to **4**B) in which the raising base **62** is disposed. Note that the distal-end side of the wall **244** formed as a curved surface may be disposed on the space **85** in which the raising base **62** is disposed. If the elastic member **112** is used as the tube **55**, creases are formed in the distal-end side portion **112***a* of the tube **55** when the raising base **62** is located in the raised position. Even in this case, it is possible to avoid as much as possible the contact between the portion of the wall **244** closer to the proximal-end side than the displacement portion **208** and the distal-end side portion **112***a* of the tube **55** where the creases are formed by raising the raising base **62**.

## Second Modification

A second modification to the endoscope **10** will be described below with reference to FIGS. **23**A to **26**B.

Here is a description of an example where a wall **344** is formed in the distal frame portion **72** of the endoscope main body **12** as shown in FIGS. **23** A to **24** B. As shown in FIGS. **23**B and **24**A, the wall **144** (see FIGS. **7**A to **7**C) need not be formed in the distal-end cover **214**.

As shown in FIG. **23**A, the wall **344** extends toward the distal-end side along the longitudinal axis L to continue to, for example, the second wall surface (side surface) **102***b* of the base portion **82** of the distal frame portion **72**. That is, the wall **344** is formed of the same material (e.g. stainless steel) as the distal frame portion **72** and extends toward the distal-end side along the longitudinal axis L from the distal end **82***a* of the base portion **82** of the distal frame portion **72**. The wall **344** is provided to separate the space **85** in which the raising base **62** of the raising portion **52** is disposed and the space **87** in which the pulling member **54** and the tube **55** are disposed. It is preferable that a surface of the wall **344** that is in contact with or close to the tube **55** is formed by, for example, fluorine coating so as to improve slidability of the tube **55** with respect to the wall **344**.

A distal-end side fitting receiving portion **216** is formed on the inner circumferential surface of the closing portion **152** of the distal-end cover **214**. The distal end **344***a* of the wall **344** is fit to the distal-end side fitting receiving portion **216** of the distal-end cover **214**. As shown in FIG. **23**B, a right-side fitting receiving portion **218** is formed on the right-side edge portion **162** of the distal-end cover **214**. Preferably, the right-side fitting receiving portion **218** is continuous with the distal-end side fitting receiving portion **218**. As shown in FIG. **24**A, in the edge portion of the wall **344**, not only the distal end **344***a* but also a portion close to the opening edge **156** is preferably supported by the cover **214**.

As shown in FIG. **25**, the raising portion **52** includes a raising base **62** having a guide path **62***a* for treatment instruments and a coupling portion **64** coupled to the raising base **62**.

The raising base **62** includes a raising base main body **362** with the guide path **62***a* and a substantially L-shaped fitting arm **364** extending from the main body. The fitting arm **364** includes a pivot shaft **372** orthogonal to the longitudinal axis L and orthogonal to the observation direction from the proximal end of the raising base main body **362** and an arm portion **374** orthogonal to the pivot shaft **372**. The pivot shaft **372** is provided on the raising base main body **362**. A pivot shaft **372** is integrated with the proximal end of the arm portion **374**. The pivot shaft **372** is shaped like a circular rod pivotally supported by a support portion **382** (described later) of the wall **344**. A support portion **376** is provided at the distal end of the arm portion **374** to support the coupling portion **64**. Between the proximal end (pivot shaft **372**) and the distal end (support portion **376**) of the arm portion **374**, a through hole **378** is formed to penetrate in a direction orthogonal to the longitudinal axis L and orthogonal to the observation direction.

As shown in FIGS. **24**A to **24**C and **26**A, a concave groove **380** is formed in the back surface of a surface of the wall **344**, which is opposed to the defining surface **84***b* of the first convex portion **84**. As shown in FIGS. **24**A, **24**B, **24**D and **26**A, a support portion **382** that supports the pivot shaft **372** as a pivot center is formed at an edge portion on the side opposite to a position where the right-side fitting receiving portion **218** of the right-side edge portion **162** of the cover **214**. The support portion **382** is formed in a substantially U-shape. The concave groove **380** is provided in a position in which an arc is drawn about the pivot shaft **372** of the fitting arm **364** supported by the support portion **382**.

As shown in FIGS. **23**A to **24**D, the raising base main body **362** is disposed in the space **85** and the pivot shaft **372** is disposed in the support portion **382**. The arm portion **374** is disposed in the space **87**. A pin **378***a* is disposed in the through hole **378**. The pin **378***a* is provided in parallel with the pivot shaft **372** at a position separated from the pivot shaft **372**. One end of the pin **378***a* is in contact with the concave groove **380**. Therefore, even though the cover **214** is not provided at the distal-end portion **32**, the pivot shaft **372** of the raising base **62** is prevented from slipping off the support portion **382** of the wall **344**. In other words, when one end of the pin **378***a* is disposed in the concave groove **380**, the concave groove **380** and pin **378***a* maintain a state

in which the pivot shaft **372** of the fitting arm **364** is supported by the support portion **382**.

As shown in FIG. **24**A, when the raising base **62** is in the lowered position, one end of the pin **378***a* is close to or in contact with one end **380***a* of the concave groove **380**. As shown in FIG. **24**B, when the raising base **62** is in the raised position, one end of the pin **378***a* is close to or in contact with the other end **380***b* of the concave groove **380**.

A cover **214** is attached to the outside of the distal-end portion **32**. As shown in FIGS. **26**A and **26**B, a convex portion **392** having an arc-shaped concave portion **392***a* is formed on the convex portion **198** of the inner circumferential surface **146** of the cover **214**. As shown in FIG. **24**D, the concave portion **392***a* supports the pivot shaft **372**. At this time, the concave portion **392***a* supports the pivot shaft **372** in a substantially annular manner in cooperation with the support portion **382**. For this reason, the concave portion **392***a* of the cover **214**, the pivot shaft **372** of the raising base **62** and the support portion **382** of the wall **344** minimizes a gap in which a liquid moves from the raising base main body **362** to the arm portion **374** through the pivot shaft **372** to suppress the movement of the liquid. Therefore, the movement of a body fluid or the like from the space **85** to the space **87** is suppressed as much as possible.

Note that the concave portion **392***a* of the convex portion **392** may be fit to the pivot shaft **66** and the support portion **88** described in the first embodiment. In this case, the movement of liquid or the like from the raising base **62** toward the outer circumferential surface **86***c* of the second convex portion **86** is suppressed as much as possible.

As shown in FIGS. **23**A to **24**B, the distal end **344***a* of the wall **344** is made close to or placed into contact with the inner circumferential surface of the cover **214** with the cover **214** properly attached to the distal-end portion **32**. In addition, the wall **344** is made close to or placed into contact with the right-side edge portion **162** of the opening edge **156** of the first structure **142***a* of the cover **214**. In this case, it becomes difficult for contaminants and the like to enter the space in which the tube **55** and the pulling member **54** are disposed. After the endoscope **10** is used, the possibility that contaminants adhere to the vicinity of the tube **55** of the distal-end portion **32** of the endoscope main body **12** is decreased. Thus, there is a high possibility that it need not be cleaned more carefully than in the above-described example. The cleaning time can thus be shortened.

Note that the cover **214** according to the second embodiment has been described as not having the wall **144**. Of course, as in the cover **314** shown in FIG. **27**, a single wall can be formed by cooperating the wall **144** of the cover **14** according to the first embodiment and the wall **344** of the distal frame portion **72** according to the second embodiment with each other. In this case, in accordance with the relationship between the wall **344** and the distal-end cover **314**, one of the structure of the raising portion **52** described in the first embodiment and the structure of the raising portion **52** described in the second modification to the second embodiment can be selected and used.

Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

What is claimed is:

**1**. A distal-end cover for use with an endoscope, the distal-end cover comprising:

a cover main body configured to be attached to a distal-end side of an insertion portion of an endoscope main body, the endoscope main body comprising:

a distal frame portion provided on the distal-end side of the insertion portion along the longitudinal axis, the distal frame portion comprising:

a first opening forming part of a channel through which a treatment instrument is inserted, and

a second opening provided separately from the first opening;

a raising lever rotatably attached to the distal frame portion, and the raising lever being configured to raise the treatment instrument to protrude from the first opening;

an elongated member inserted through the second opening, the elongated member being connected to the raising lever and configured to be moved along the longitudinal axis of the insertion portion to rotate the raising lever; and

a tube inside which the elongated member is disposed, one end of the tube being watertightly connected to one of the raising lever and the elongated member, and the other end of the tube being watertightly connected to the second opening; and

a wall provided on the cover main body,

the wall being provided between the tube and the raising lever closer to the distal-end side along the longitudinal axis than the first opening when the cover main body is attached to an outside of the distal frame portion along the longitudinal axis of the insertion portion, and

the wall being deformed by the tube and the elongated member when the cover main body is removed from the outside of the distal frame portion.

**2**. The distal-end cover of claim **1**, wherein:

the cover main body has a cylindrical shape and includes a proximal-end opening and an opening edge through which the treatment instrument is inserted, and

the wall is provided on the opening edge.

**3**. The distal-end cover of claim **2**, wherein:

the wall is formed separately from the cover main body, and

the wall is fixed to the opening edge.

**4**. The distal-end cover of claim **2**, wherein the wall extends from the opening edge toward an inner circumferential surface of the cover main body opposed to the opening edge.

**5**. The distal-end cover of claim **1**, wherein the wall is formed integrally with the cover main body.

**6**. The distal-end cover of claim **1**, wherein the wall includes a fragile portion which is bent by pressure received from the tube when the cover main body is removed from the endoscope main body.

**7**. The distal-end cover of claim **1**, wherein the cover main body comprises:

a cylindrical first structure comprising:

a proximal-end opening, and

an opening edge through which the treatment instrument is inserted, the first structure being disposed outside the distal frame portion, and the first structure protecting the distal frame portion, the raising lever, the elongated portion and the tube,

a cylindrical second structure which holds an outer circumference of the proximal-end opening with the opening edge exposed; and

the wall is formed integrally with the second structure and extends from the opening edge toward the first structure opposed to the opening edge.

**8**. An endoscope comprising:

an endoscope main body comprising:

an insertion portion elongated along a longitudinal axis, the insertion portion being configured to be inserted into a subject;

a distal frame portion provided on a distal-end side of the insertion portion along the longitudinal axis, the distal frame portion comprising:

a first opening forming part of a channel through which a treatment instrument is inserted, and

a second opening provided separately from the first opening;

a raising lever rotatably attached to the distal frame portion, the raising lever being configured to raise the treatment instrument to protrude from the first opening;

an elongated member inserted through the second opening, the elongated member being connected to the raising lever and configured to be moved along the longitudinal axis of the insertion portion to rotate the raising lever; and

a tube inside which the elongated member is disposed, one end of the tube being watertightly connected to one of the raising lever and the elongated member, and the other end of the tube being watertightly connected to the second opening; and

a distal-end cover comprising:

a cover main body configured to be attached to a distal-end side of an insertion portion of an endoscope main body; and

a wall provided on the cover main body,

the wall being provided between the tube and the raising lever closer to the distal-end side along the longitudinal axis than the first opening when the cover main body is attached to an outside of the distal frame portion along the longitudinal axis of the insertion portion, and

the wall being deformed by the tube and the elongated member when the cover main body is removed from the outside of the distal frame portion.

**9**. The endoscope of claim **8**, wherein:

the tube is provided such that creases are formed therein as the elongated member moves; and

the wall separates a portion of the tube where the creases are formed from the raising lever between the tube and the raising lever.

**10**. The endoscope of claim **9**, wherein the creases of the tube are easily formed at a position closer to the one end of the tube than the other end thereof.

**11**. The endoscope of claim **8**, wherein a distal-end opening of the first opening is closer to the distal-end side along the longitudinal axis than a distal-end opening of the second opening, in the distal frame portion.

**12**. The endoscope of claim **8**, wherein:

the raising lever is rotatable about a pivot shaft with respect to the distal frame portion;

the pivot shaft is positioned on the inner circumferential surface of the distal-end cover with respect to the distal frame portion, the wall is provided between the tube and the raising lever when the cover main body is attached to the outside of the distal frame portion; and

the positioning of the pivot shaft with respect to the distal frame portion is released as the cover main body is removed from outside the distal frame portion and the wall is moved from between the tube and the raising lever.

**13**. The endoscope of claim **8**, wherein:

the distal frame portion includes an engaging portion which engages the cover main body with the distal frame portion when the cover main body is attached to the outside of the distal frame portion along the longitudinal axis of the insertion portion; and

the engaging portion is separated from a portion between the tube and the raising lever, in which the wall is provided.

**14**. A distal-end cover for use with an endoscope, the distal-end cover comprising:

a cover main body configured to be attached to a distal frame portion of an insertion portion of an endoscope main body; and

a wall provided on the cover main body,

the wall being provided between a tube and a raising lever provided on the endoscope main body, the wall being closer to the distal-end side along the longitudinal axis than a first opening of the distal frame portion forming part of a channel through which a treatment instrument is inserted when the cover main body is attached to an outside of the distal frame portion along the longitudinal axis of the insertion portion, and

the wall being deformed by the tube and an elongated member of the endoscope main body when the cover main body is removed from the outside of the distal frame portion,

where:

the elongated member is disposed inside the tube,

the elongated member is inserted through a second opening provided separately from the first opening,

the elongated member is connected to the raising lever, and is configured to be moved along the longitudinal axis of the insertion portion to rotate the raising lever,

one end of the tube is watertightly connected to one of the raising lever and the elongated member, and the other end of the tube is watertightly connected to the second opening, and

the raising lever of the endoscope main body is rotatably attached to the distal frame portion, and is configured to raise the treatment instrument to protrude from the first opening.

**15**. A distal-end cover for use with an endoscope, the distal-end cover comprising:

a cover main body configured to cover a distal end of the endoscope, the cover main body defining an interior configured to accommodate the distal end of the endoscope, the cover main body comprising:

an edge defining an opening, the opening having a central axis offset from a longitudinal axis of the cover main body;

a wall having a single side attached to a portion of the edge of the opening such that all other portions of the wall are cantilevered from the portion of the edge of the cover main body, all of the other portions of the wall extending from the portion of the edge into the interior of the cover main body.

**16**. The distal-end cover of claim **15**, wherein the cover main body has a cylindrical shape and includes a proximal-end opening.

**17**. The distal-end cover of claim **15**, wherein:

the wall is formed separately from the cover main body, and

the wall is fixed to the portion of the edge.

**18**. The distal-end cover of claim **15**, wherein the wall extends from the edge toward an inner circumferential surface of the cover main body opposed to the opening.

**19**. The distal-end cover of claim **15**, wherein the wall is formed integrally with the cover main body.

**20**. The distal-end cover of claim **15**, wherein the wall includes a fragile portion connecting the wall to the portion of the edge, the fragile portion being more fragile than other portions of the wall.

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